

**MISSISSIPPI RIVER**

**POOL 11 ISLANDS  
SUNFISH LAKE AND MUD LAKE**

**GRANT COUNTY, WISCONSIN AND DUBUQUE COUNTY, IOWA**

**U.S. ARMY CORPS OF ENGINEERS  
ENVIRONMENTAL MANAGEMENT PROGRAM  
HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

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**OPERATION AND MAINTENANCE  
MANUAL**

**AUGUST 2012**

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**US Army Corps  
of Engineers** ®  
Rock Island District

**U.S. ARMY CORPS OF ENGINEERS  
ROCK ISLAND DISTRICT  
CLOCK TOWER BUILDING  
PO BOX 2004  
ROCK ISLAND, ILLINOIS 61204**

**OPERATION AND MAINTENANCE MANUAL  
POOL 11 ISLANDS  
SUNFISH LAKE AND MUD LAKE  
ENVIRONMENTAL MANAGEMENT PROGRAM  
HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

**MISSISSIPPI RIVER MILES 583.3 TO 593.0  
GRANT COUNTY, WISCONSIN AND DUBUQUE COUNTY, IOWA**

**AUGUST 2012**

**OPERATION AND MAINTENANCE MANUAL**  
**Pool 11 Islands**  
**Sunfish Lake and Mud Lake**  
**Environmental Management Program**  
**Habitat Rehabilitation and Enhancement Project**  
**Grant County, Wisconsin and Dubuque County, Iowa**  
**AUGUST 2012**

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**OPERATION AND MAINTENANCE MANUAL**  
**Pool 11 Islands**  
**Sunfish Lake and Mud Lake**  
**Environmental Management Program Project**  
**Grant County, Wisconsin and Dubuque County, Iowa**  
**AUGUST 2012**

**PREFACE**

This Operation and Maintenance (O&M) manual is for the Pool 11 Islands Environmental Management Program (EMP) Habitat Rehabilitation and Enhancement Project (HREP) located on the Upper Mississippi River National Wildlife and Fish Refuge in Dubuque County, Iowa and Grant County, Wisconsin, on the Mississippi River. This project was Federally constructed and is thus considered a Federal project. This project is eligible for repairs under the Environmental Management Program. This O&M manual has been compiled by the US Army Corps of Engineers (USACE), Rock Island District to assist local officials in complying with the requirements for operating and maintaining the project.

The O&M manual provides essential operation and maintenance instructions and references to be used by personnel knowledgeable of the project. The routine inspection program of the completed Federal project administered under EMP by the USACE is detailed in Section 10. Local inspection requirements and follow-up corrective action reporting are also listed. Additionally, the O&M manual serves as a reference document containing descriptions of the features involved in the original construction of the project, the construction history, a copy of the Memorandum of Agreement (MOA) between the US Fish and Wildlife Service (USFWS) and the USACE, and a listing of project points of contact.

Included within this O&M manual are copies of as-built drawings, a blank annual inspection report form and other references related to the Pool 11 Islands EMP HREP (Project).

The O&M manual should be periodically updated by the USFWS to incorporate best professional practices. The O&M manual will only be updated by the USACE following Federal action at the Project. All points of contact, websites and supplier information should be checked and verified on a yearly basis by the USFWS. Physical modifications and any operational changes impacting the Project must be approved and documented by USACE. A copy of the routine inspections should also be attached to the O&M manual.

**OPERATION AND MAINTENANCE MANUAL**  
**Pool 11 Islands**  
**Sunfish Lake and Mud Lake**  
**Habitat Rehabilitation and Enhancement Project**  
**Grant County, Wisconsin and Dubuque County, Iowa**

**SECTIONS**

**1. GENERAL**

**1.1. Purpose.** This Operation and Maintenance (O&M) manual describes the operation, maintenance and upkeep responsibilities for the Pool 11 Islands Environmental Management Program (EMP) Habitat Rehabilitation and Enhancement Project (HREP) that is required by the US Army Corps of Engineers (USACE) to receive Federal assistance under the Environmental Management Program. The instructions are consistent with the general procedures presented in the September 2001 Definite Project Report (DPR).

This manual serves to furnish the US Fish and Wildlife Service (USFWS) officials with information and guidance to assist in the orderly and efficient use of the constructed features to meet project goals and objectives. Likewise, adequate maintenance of habitat rehabilitation and enhancement projects is required to ensure serviceability of project features. The intent of the maintenance instructions is to present preventative maintenance information consisting of systematic inspections and subsequent corrective actions, which should ensure long-term use. A timely preventative maintenance program reduces and prevents major damage to constructed features. The USFWS must maintain the project in an acceptable condition as defined in this O&M manual and must participate in the inspection program. This manual was written for personnel familiar with the Pool 11 Islands EMP HREP (Project) and does not contain detailed information which is common to site personnel or which is presented in other existing manuals or regulations. This manual provides the general standards of maintenance and establishes an initial frequency of maintenance inspections that should ensure satisfactory Project performance. This manual is the latest in a series of O&M guidance specifically designed to assist in the operation and maintenance of the Project. This document supersedes and incorporates previous Project specific O&M manuals. Although this document is intended to call out the most salient issues, additional guidance for proper operation and maintenance is present in USACE guidance and policy documents. The Code of Federal Regulations specified O&M requirements are attached in Appendix C. Additionally the USACE provides clarification of proper operation and maintenance of Project features that may require efforts that are additional to those stated in this document. The USACE encourages an active dialogue between the USACE and the sponsor to indicate USACE policy clarifications that may have O&M implications for the Project. Table 1.1 gives a brief history of the planning and construction process of the Project. Table 1.2 details the goals, objectives and features of the Project.

**Table 1.1. Summary of Planning and Construction Activities**

<b>Project Phase</b>	<b>Purpose</b>	<b>Project Milestone</b>	<b>Date Completed</b>
<b>Pre-Project</b>	Identify and define problems and establish need of project	Fact Sheet	March 2004
<b>Engineering and Design</b>	Quantify project objectives, perform preliminary design, satisfy NEPA <sup>3</sup> and permit requirements, develop performance evaluation plan, obtain project approval for construction	SHPO <sup>1</sup> Concurrence Draft DPR DPR Public Review & EA <sup>2</sup> NEPA Public Review Obtain Section 401/404 Permits Final DPR & EA DPR approval Approve Plans and Specifications Memorandum of Agreement with USFWS	July 1995 April 1999 February 2001 March 2001 June 2001 September 2001 May 2002 May 2002 March 2002
<b>Construction</b>	Finalize plans and specifications, obtain O&M agreement, advertise and award construction contracts, construct project	Request for Proposals Proposals Due Award Contract Notice to Proceed Construction Complete	April 2002/May 2004 May 2002/June 2004 July 2002/August 2004 August 2002/August 2004 June 2004/August 2006
<sup>1</sup> State Historical Preservation Office <sup>2</sup> Environmental Assessment <sup>3</sup> National Environmental Policy Act			

**Table 1.2. Project Goals, Objectives, and Features**

Goals	Objectives	Project Features
Restore and Protect Aquatic Habitat	Reduce resuspension of sediments  Create areas with flow and depth diversity  Increase abundance and diversity of aquatic plants  Enhance nesting and brooding habitat for migratory birds	Construct embankment  Excavate channels in backwater areas
Restore and Protect Backwater Habitat	Reduce sedimentation in backwaters  Provide reliable food resources for migratory birds and resident wildlife  Create off-channel deep-water areas to provide year-round habitat for centrarchids and associated species	Construct flow control structure  Construct embankment  Excavate channels in backwater areas  Construct sediment trap

**1.2. Project Description.** This section describes the Project, as it exists at the time of the O&M manual’s printing. See Section 5 for a discussion on the history of the Project including construction and post-flood rehabilitation. The Project features consist of deflection embankments, a confined disposal facility, deep water channels, flow inlets with a sediment trap and a riprap dike. These features are shown generically in Figure 1.1 and more specifically in the plates found in Appendix A.

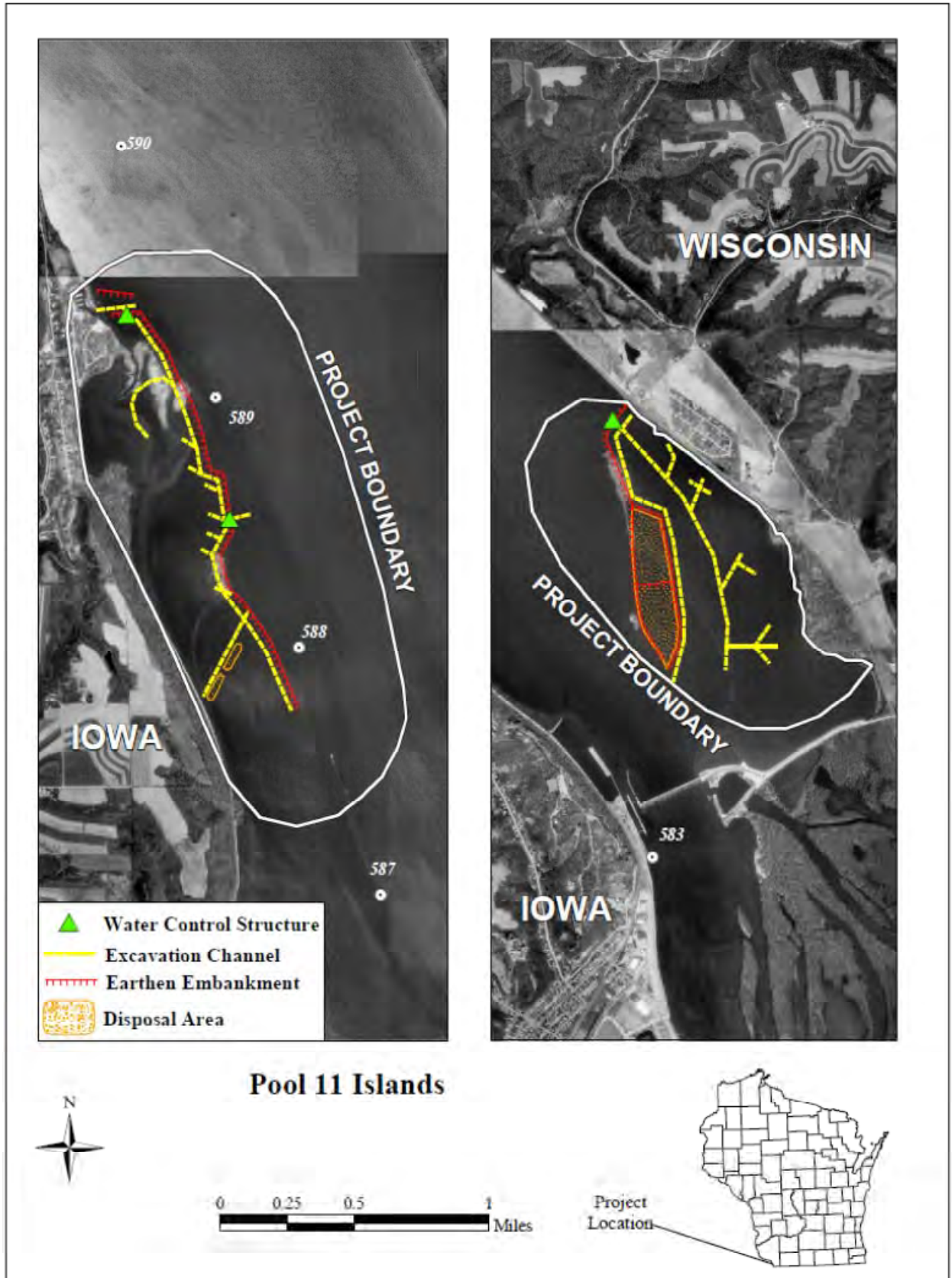


Figure 1.1. Pool 11 Islands Project Overview Map

**1.3. Project Function.** The Project is classified as a Habitat Rehabilitation and Enhancement Project that was Federally constructed and is Federally maintained. It was designed to restore and protect backwater and aquatic habitat by reducing resuspension of sediments, creating areas with flow and depth diversity, increasing the abundance and diversity of aquatic plants, enhancing nesting and brooding habitat for migratory birds, providing reliable food sources for migratory birds and resident wildlife and creating off-channel deep-water areas to provide year-round habitat for centrarchids and associated species.

## **2. AUTHORIZATION**

This O&M manual serves to meet the Department of the Army's requirements under the 1985 Supplemental Appropriations Act (Public Law 99-88), Section 1103 of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662), Section 405 of WRDA 1990 (Public Law 101-640), Section 107 of WRDA 1992 (Public Law 102-580), and Section 509 of WRDA 1999 (Public Law 106-53). The U.S. Army Corps of Engineers, Rock Island District (Corps) funded and constructed the Project under these authorizations.

As set forth in the Memorandum of Agreement (MOA), included in Appendix B - Exhibit A, the USFWS has agreed to maintain and operate, at no cost to the USACE, the Project including all the repaired or restored Project features in accordance with Section 107(b) of the WRDA of 1992, Public Law 102-580.

## **3. LOCATION**

The Project is located on the Upper Mississippi River National Wildlife and Fish Refuge in Dubuque County, Iowa and Grant County, Wisconsin on the right and left descending banks of the Mississippi River, respectively, in Pool 11, approximately 17 miles downstream of Cassville, Wisconsin and 2.3 miles upstream of Dubuque, Iowa. The Project extends from Mississippi River Miles (RM) 583.3 to 593.0. The Project is in a rural setting. The constructed features of the Project lie within Sections 10, 11, 14, 15 and 23 of Township 90 North, Range 2 East, Dubuque County, Iowa and Sections 17, 18, 19 and 20 of Township 1 North, Range 2 West, Grant County, Wisconsin. Sunfish Lake consists of 426 acres of aquatic habitat. Mud Lake consists of 493 acres of aquatic habitat. Detailed maps of the Project are shown in Section 1.2. The Project stretches from Lock and Dam 11 upstream to Potosi Creek in Dubuque County, Iowa, and Grant County, Wisconsin. The Project area roughly encompasses the aquatic and floodplain lands between the rail lines that parallel either side of the Mississippi River. All Project lands are in Federal ownership and are managed by the USFWS as part of the Upper Mississippi River National Wildlife and Fish Refuge.

## **4. PERTINENT AREA INFORMATION**

**4.1. Hydrologic Data.** Table 4.1 shows how river elevation (stage) for the Pool 11 Islands and the surrounding areas relates to flooding potential. The Mississippi River at Lock and Dam 10 (Guttenberg, IA) gage is 25.6 miles upstream of the Project and the Mississippi River at Lock and Dam 11 (Dubuque, IA) gage is 0.3 miles downstream of the Project. The closer gage should be used to aid in flood forecasting and preparation. It should be noted that the Mississippi River gages are referenced to Mean Sea Level (MSL) 1912 datum and the tributary gages are referenced to National Geodetic Vertical Datum (NGVD) 1929 datum. The most accurate datum is North American Vertical Datum (NAVD) 1988. Each of these datums is slightly different from the other, varying by a few tenths of a foot in elevation. The

National Weather Service provides an online conversion tool between 1929 and 1988 datums at the following location: <http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html>. For conversions from 1912 to one of the other datums, use the values in Figure 4.1. Historical flow data is provided in Figure 4.2. The maximum, minimum and average flows are shown for the years 1986 to 2011.

<b>Table 4.1. River Elevation Effects: Mississippi River at Lock and Dam 11 (Dubuque, IA) Gage (DLDI4)**</b>	
<b>River Elevation (Stage)</b>	<b>Affected Areas</b>
603.2 (15.0)	Action Stage.
604.2 (16.0)	Flood Stage.
605.2 (17.0)	Moderate Flood Stage.
607.74 (19.54)	Top of Sunfish Lake embankment.
608.10 (19.9)	Top of Mud Lake embankment.
608.7 (20.5)	Major Flood Stage.
610.0 (22.0)	Water affects Volunteer Drive leading to Lock and Dam 11.

\*\*Based on the Mississippi River at Lock and Dam 11 (Dubuque, IA) gage, datum 588.2 ft MSL 1912.

**4.2. River Gages Information.** Information can be obtained from the USACE website: <http://www.rivergages.com> – First select “Rock Island District” from the “Water Level By” drop down menu; then select “Mississippi River and Passes” from the “Rock Island District Basins” drop down menu; then select “Mississippi River at Lock and Dam 11 (Dubuque, IA)” from the list. The gages are listed from upstream to downstream.

**Mississippi River at Lock and Dam 11(Dubuque, IA) (DLDI4)\***

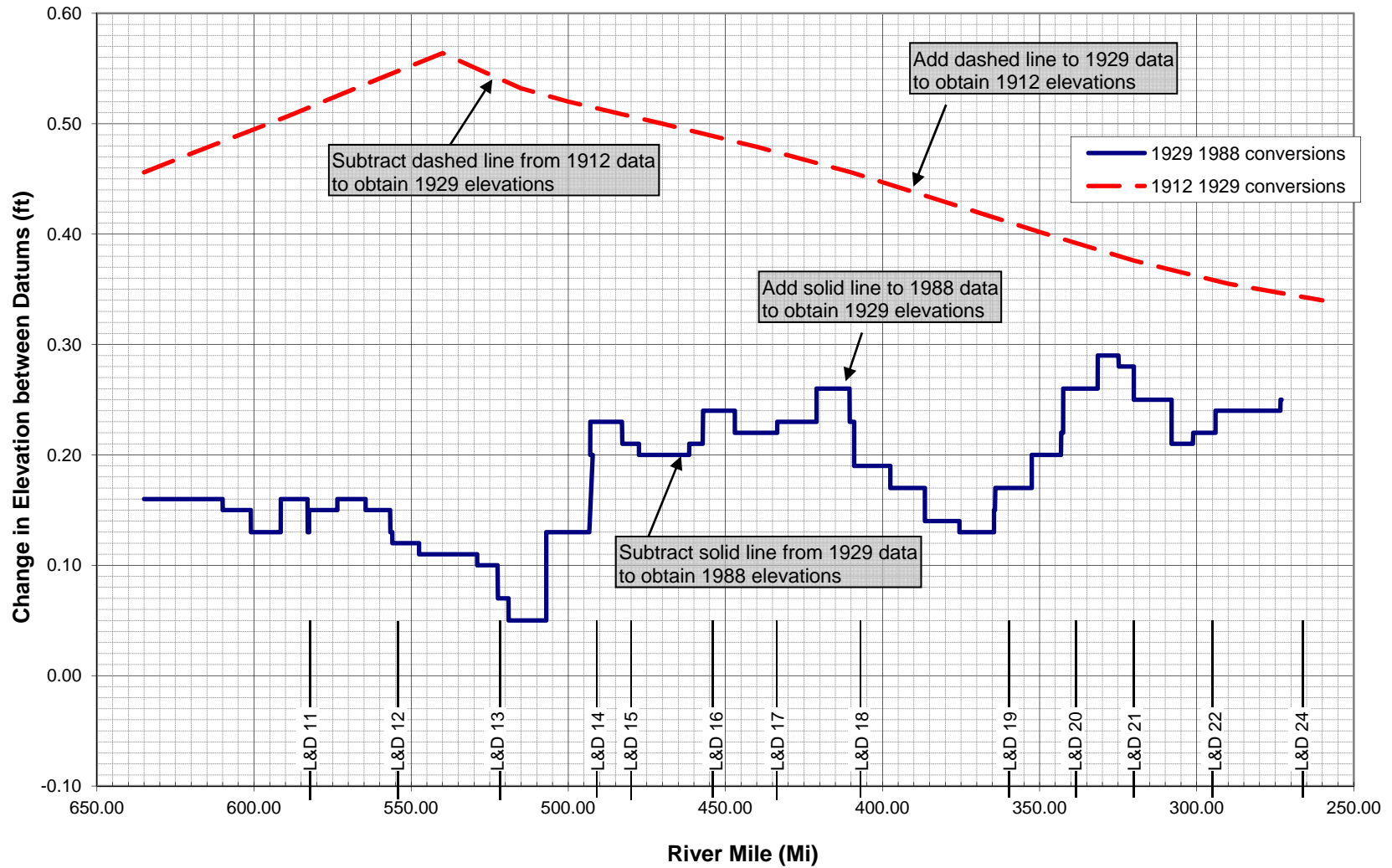
- ◆ Gage Datum (zero elevation): 588.20 feet MSL 1912
- ◆ Flood Stage @ Gage: 16.0 feet
- ◆ River Mile: 583.0
- ◆ Location: 11 Lime Street, at the foot of the bluff below Eagle Point Park, 2.7 river miles upstream of the US Highway 151 bridge.

**Historical Top 5 Crests**

1. 25.69 ft on 04/26/1965
2. 23.91 ft on 04/21/2001
3. 22.32 ft on 07/01/1993
4. 21.74 ft on 04/23/1969
5. 21.64 ft on 04/22/1951

\*Water control recommends adding 0.4 to the tail forecast to account for swellhead at the dam.

**Vertical Datum Conversions in Rock Island District**  
 (Applies to locations on the Mississippi River. For other locations please contact Survey Section EC-TS)  
 (For a given elevation: 1912 > 1929 > 1988 )



**Figure 4.1. Vertical Datum Conversions in Rock Island District**



### Lock & Dam 11 Flows 1986 - 2011

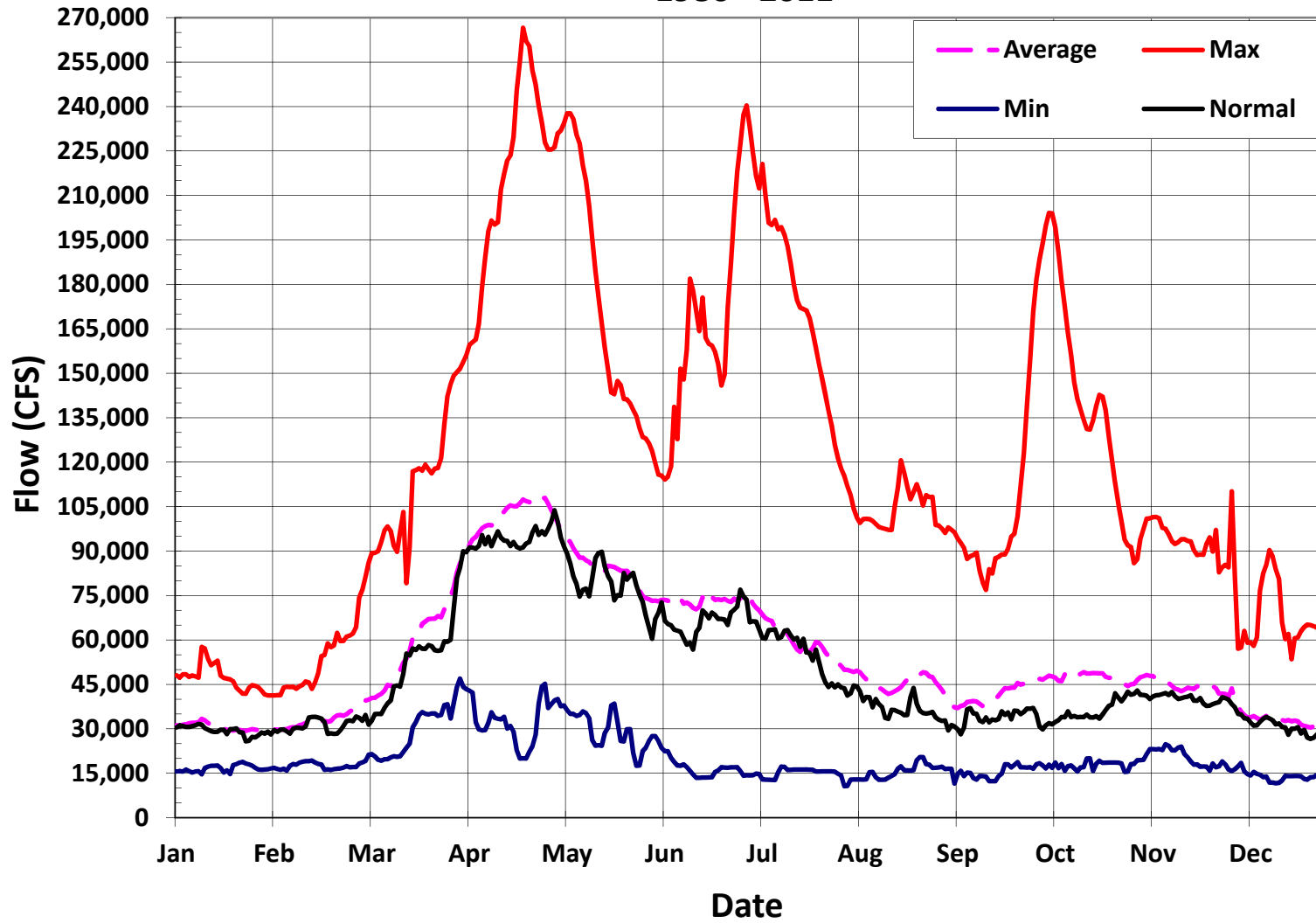


Figure 4.2. Lock and Dam 11 Flows: 1986 – 2011

## 5. PROJECT CONSTRUCTION HISTORY

The Project was designed by the USACE. The USACE funded 100% of the Project construction. The Project sponsor is the USFWS. Iowa Department of Natural Resources (IADNR) and Wisconsin Department of Natural Resources (WIDNR) are project cooperators. All operation and maintenance is to be funded and performed by USFWS. Design considerations and investigations are presented in the DPR dated September 2001. Table 1.1 provides a summary of planning, design, and construction activities associated with the Project. Goals and objectives were formulated during the design phase. Table 1.2 provides a summary of Project goals, objectives, and features.

The Project restores and protects backwater aquatic habitat as well as aquatic habitat. Features used include islands and off-channel dredging. There were two stages of this Project.

Sunfish Lake is the southernmost part of the Project, located on the Wisconsin side of the river between RM 583 and 584, just upstream of Lock and Dam 11. The main construction features of Sunfish Lake include a deflection embankment, confined disposal facility (CDF), several channels for deep water fish habitat, a flow inlet with sediment trap and a riprap dike along the upstream portion of the embankment. The locations of these items are shown on Plate C1 in the Sunfish Lake drawings.

Mud Lake is the northernmost part of the Project, located on the Iowa side of the river between RM 588 and 589. The main construction features of Mud Lake include two islands alongside the channels, dredged channels for deep water fish habitat and two flow inlets. The locations of these items are shown on Plate C1 in the Mud Lake drawings.

**5.1. Primary Project Features.** The primary Project features are listed below.

**5.1.1. Deflection Embankments.** In both stages, deflection embankments were constructed and exposed surfaces were either vegetated or riprapped. The embankments were constructed with the material dredged from the river bottom to create the deep water channel. In Sunfish Lake, the material was mechanically dredged due to high clay content. Mechanically dredging the channel adjacent to the embankments allowed for direct placement of material within the embankment cross section without having to load the material onto a barge and double handle it. Additional channels and the sediment trap were hydraulically dredged. In Mud Lake, the material was only mechanically dredged. The embankments are used to divert main channel flow around the Project sites and allow for lower velocities, reduced sedimentation and increased amounts of aquatic vegetation. The embankments also protect shallow water areas from wind fetch and sediment resuspension to improve environmental conditions for the growth of aquatic vegetation.

**5.1.1.1. Stage I, Sunfish Lake, Contract #DACW25-02-C-0024.** This stage created the 1568 m (5145 ft) embankment that ties in to the Wisconsin shore at the upstream end (RM 584.1) and extends out toward the main channel, terminating near RM 583.5. See Plates 3-24 in Appendix A. The embankment's top elevation was constructed to 185.60 m (608.92 ft). This elevation is 0.3 m (1 ft) above the 20 percent chance exceedance flood elevation plus an additional 0.3 m (1ft) for potential settling. The top width is 3 m (10 ft) with side slopes of 4H:1V or shallower. A 3 m (10 ft) bench on the river side of the embankment is planted with willow stakes to protect against wind, wave, and current erosion. The borrow for this embankment was mechanically dredged from the river bottom, downstream and adjacent to the embankment alignment using a 275 ton crane with a 3 and 4 cubic yard bucket. Some of the material was obtained from within the confined disposal facility (CDF) to

increase the capacity for hydraulically dredged material from the habitat channels. In some areas, the embankment is protected against wind, wave and current erosion by a 0.5 m (1.6 ft)-thick layer of Iowa Class E riprap and a 0.25 m (10 inch)-thick layer of bedding stone. An 8-inch hydraulic pipeline dredge was used to dredge channels. The dredged material was placed in the CDF. The effluent from the CDF was further processed by a barge-mounted settling system in order to meet water quality standards. The west side of the island experienced severe erosion during construction. The construction contract was modified to add a riprap dike from Stations 7+70.37A to 13+50A on an old road bed (refer to Plate 9).

To maintain a fresh inflow of dissolved oxygen, a notched rock weir was constructed at the upstream end of the embankment. The weir crest elevation is 0.79 m (2.6 ft) below flat pool elevation. Downstream of the weir, a sediment trap was constructed to reduce sedimentation in the newly dredged channels. The trap was sized to retain the majority of the expected sediment load through the weir for a 50-year period. The design discharge of the notch is 1.1 cubic meters per second (cms) (40 cubic feet per second (cfs)) during average January conditions with no ice cover.

**5.1.1.2. Stage II, Mud Lake, Contract #W912EK-04-C-0007.** This stage created a protected backwater off the main channel. The 2822 m (9259 ft) embankment ties into the Iowa shore at the upstream end near RM 589.4 and extends out toward the main channel and then angles downstream paralleling the main channel, ending near RM 587.7. See Plates 25-41 in Appendix A. The embankment's top elevation was constructed to 185.60 m (608.92 ft), 0.3 m (1 ft) above the 20 percent chance exceedance flood elevation plus 0.3 m (1 ft) for potential settling. A second 302 m (991 ft) embankment was constructed upstream of the primary embankment. This secondary embankment was designed to deflect sediment and debris that naturally accumulate at the head of Mud Lake, thereby decreasing maintenance of the upstream notched rock weir and decreasing sediment loads into Mud Lake. This arrangement also allows pleasure craft to access the adjacent marina. The embankment top width is 10 m (33 ft) (except for the secondary embankment width at 3 m (10 ft)) with side slopes no steeper than 6H:1V. The embankments were created by mechanical dredging using 275 ton crane with 3 and 4 cubic yard buckets. Some areas of the embankment are protected against wind, wave, and current erosion with a 0.25 m (10 inch)-thick layer of bedding stone and a 0.5 m (1.6 ft)-thick layer of Iowa Class E riprap.

At the lower end channel entrance, the contractor was allowed to side cast a small amount of material for their convenience. This created a small berm at the downstream end of the embankment and channel. There are no maintenance requirements for the side cast berm as it is not part of the project design.

To maintain a fresh inflow of dissolved oxygen, two notched rock weir structures were constructed, one near the embankment's midpoint at station 14+30 and one near the upstream end at station 2+10. The weir crest elevation is 0.60 m (2 ft) below flat pool elevation for the upper inlet and directly at flat pool elevation for the lower inlet. The design flow rates of the notches are roughly 0.57 cms (20 cfs), each during low flow winter conditions. The crest elevation of the notches were modified using rock at the request of the IADNR after their monitoring measured high flows in the excavated channel that would discourage overwintering fish use. The weir crest elevations previously stated reflect this change.

**5.1.2. Off-Channel Dredging.** Off-channel dredging was also used at both sites. The purpose of the dredging was to increase the depths in off-channel habitats, provide access between shallow and deep aquatic areas, and increase overwintering fish habitat for centrarchids and associated species.

**5.1.2.1. Stage I, Sunfish Lake, Contract #DACW25-02-C-0024.** A series of deep-water channels totaling 13.1 ha (32.4 acres) were dredged in the backwater area protected by the deflection embankment. A 2-cell containment area was constructed as part of the embankment to hold the hydraulically dredged material. Both the hydraulically and mechanically dredged channels were excavated to a bottom elevation of 181.31 m (594.85 ft), a bottom width of 10 m (33 ft), and side slopes of approximately 3H:1V. The hydraulically dredged channels were dredged by an 8 inch hydraulic pipeline dredge. The mechanical dredging was accomplished utilizing a 275 ton crane with 3 and 4 cubic yard buckets. Dredging depths were based on historic sedimentation rates and are discussed in detail in the DPR. Two channel alignments (A & B) parallel the embankment alignment. The additional channels (D through M) connect to the first channel alignments and extend east and south towards the shoreline. These details can be seen on Plate 3 in Appendix A. Additionally, Option Areas "A" and "C" were either partially or fully dredged to elevation 182.0 meters as part of the Project. Details showing the location of this dredging are shown on Plate 23 (Sheet C20) and Plate 24 (Sheet C21) in Appendix A.

**5.1.2.2. Stage II, Mud Lake, Contract #W912EK-04-C-0007.** The borrow for the Mud Lake embankment was mechanically dredged from the river bottom, landward and adjacent to the embankment alignment. The resulting deep-water channel was excavated to a bottom elevation of 181.45 m (595.31 ft), a minimum bottom width of 10 m (33 ft), side slopes of approximately 3H:1V, and a total 11.2 ha (27.6 acres) of bottom area. Several high spots were created with riprap in the dredged channel to retain the warmer bottom water during overwintering periods.

A connecting channel to Zollicoffer Slough and a channel into the historic Mud Lake were dredged. The dredged channel into Zollicoffer Slough provides a reliable connection to the main channel for the slough's existing deep water. All dredging was accomplished using a 275 ton crane with 3 and 4 cubic yard buckets.

The dredged channel into Mud Lake was placed away from the shore to minimize the potential for shoreline development such as boat docks that would create additional disturbance to the backwater lake. In addition to increasing fish access and fish habitat in upper Mud Lake and Zollicoffer Slough, the dredged channels allow for boat access. Material from these channels was used in the construction of the embankment. These channels have the same dimensions as the channel created for embankment construction. Alignment C follows the longer of the islands and Alignment D follows the shorter. There are additional alignments (E through N) that extend from Alignment C to the east or west and provide additional habitat. These details can be seen on Plate 26 in Appendix A.

**Table 5.1. Project Feature Summary**

<b>Item</b>	<b>Quantity</b>	<b>Unit of Measure</b>
<b>Stage I, Sunfish Lake, Contract # DACW25-02-C-0024</b>		
<b>Sunfish Lake Island</b>		
Length	1,500 (4,921.26)	m <sup>1</sup> (feet)
Crown Width	3 (9.84)	m (feet)
Side Slopes	6:1	H:V <sup>2</sup>
Embankment Height	20 percent annual chance exceedance plus 0.3m (1 foot)	flood frequency
Elevation	185.27(607.84) – 185.24 (607.74)	m (ft NGVD <sup>3</sup> 1912)
Avg. River Bottom Elev.	183 (600.39)	m (ft NGVD 1912)
Embankment Volume	55,685 (72,833.23)	CM (CY)
Riprap (Iowa Class E)	8,185 (9,022.418)	MG (Tons)
Thickness	0.5 (1.64)	m (ft)
Top Elevation	184.09 (603.97)	m (ft NGVD 1912)
Bedding Stone	4,093 (4,511.76)	MG (Tons)
Thickness	0.25 (9.84)	m (inches)
Notched Weir Width (Bottom)	3.5 (11.48)	m (ft)
Bottom Elevation	183.03 (600.49)	m (ft NGVD 1912)
Seeding	3.25 (8.03)	HA (acres)
<b>Sunfish Lake Channels</b>		
Length (hydraulic)	3,307 (10,849.74)	m (feet)
Length (mechanical)	1,082 (3,549.87)	m (feet)
Bottom Width	10 (32.81) (minimum)	m (feet)
Side Slopes	3: 1	H:V
Bottom Elevation	179.79 (589.86)	m (ft NGVD 1912)
Excavation Volume (hydraulic)	207,971 (272,015.80)	CM (CY)
Excavation Volume (mechanical)	92,975 (121,606.70)	CM (CY)
<b>Sunfish Lake Containment Cells</b>		
Length	1,060 (3,477.69)	m (feet)
Crown Width	3 (9.84)	m (feet)
Side Slopes	6:1	H:V <sup>2</sup>
Level of Protection	20 percent annual chance exceedance plus 0.3m (1 foot)	flood frequency
Elevation	185.25 (457.76) – 185.24 (457.74)	m (ft NGVD 1912)
Embankment Volume	39,355 (51,474.40)	CM (CY)
Seeding	1.1 (2.72)	HA (acres)
<b>Stage II, Mud Lake, Contract # W912EK-04-C-0007</b>		
<b>Mud Lake Islands</b>		
Length	3,038 (9967.19)	m (feet)
Crown Width	10 (32.81)	m (feet)

Item	Quantity	Unit of Measure
Side Slopes	6: 1	H:V
Embankment Height	20 percent annual chance exceedance plus 0.3m (1 foot)	flood frequency
Elevation	185.39 (608.23) – 185.35 (608.10)	m (ft NGVD 1912)
Avg. River Bottom Elev.	183 (600.39)	m (ft NGVD 1912)
Embankment Volume	239,972 (313871.50)	CM (CY)
Riprap (Iowa Class E)	16,491 (18178.22)	MG (Tons)
Thickness	0.5 (1.64)	m (feet)
Top Elevation	184.09 (603.97)	m (ft NGVD 1912)
Bedding Stone	8245 (9088.56)	MG (Tons)
Thickness	0.25 (9.84)	m (inches)
Concrete Weirs	2	EACH
Width	3.66 (12) – upper 1.83 (6) - lower	m (feet)
Sill Elevation	183.19 (601.02) – upper 183.80 (603.02) – lower	m (ft NGVD 1912)
Seeding	7.2 (17.79)	HA (acres)
<b>Mud Lake Channels</b>		
Length (along embankment)	2730 (8956.69)	m (feet)
Length (along hook)	315 (1033.47)	m (feet)
Length (of offshoots)	350 (1148.29)	m (feet)
Bottom Width	10 (minimum) (32.81)	m (feet)
Side Slopes	3:1	H:V
Bottom Elevation	180.37 (591.77)	m (ft NGVD 1912)
Excavation Volume	252,662 (330469.40)	CM (CY)

<sup>1</sup>m=meters

<sup>2</sup>H:V=horizontal : vertical

<sup>3</sup>ft NGVD=feet National Geodetic Vertical Datum

**5.1.3. Right of Way (ROW) Drawings.** It is imperative to have clearly established ROW drawings for the Project. ROW drawings can be found in Appendix B.

**5.2. Project Contract Numbers and Construction Contractors.**

Contract: Stage I, Sunfish Lake  
Number: DACW25-02-C-0024  
Contractor: JF Brennan Co  
820 Bainbridge St  
La Crosse, Wisconsin 54603  
Started: July 26, 2002  
Completed: June 2004  
Cost: \$4,132,228.85

Contract: Stage II, Mud Lake

Number: DACW25-04-C-0007  
 Contractor: JF Brennan Co  
 820 Bainbridge St  
 La Crosse, Wisconsin 54603  
 Started: August 9, 2004  
 Completed: July 2005  
 Cost: \$3,482,920.02

**Table 5.2. Actual Project Costs**

Item	Description	Quantity	U/M	Unit Price	Amount
Stage I, Sunfish Lake, Contract # DACW25-02-C-0024					
0001	Mobilization		1LS <sup>1</sup>		\$245,000.00
0002	Clearing, Embankment Areas		1LS		\$3,000.00
0003	Stump Removal, Mechanical and Channel Excavation Areas				
0003AA	First 50 Each		50EACH	\$175.00	\$8,750.00
0003AB	Over 50 Each		459EACH	\$120.00	\$55,080.00
0004	Mechanical Excavation				
0004AA	First 70,000 Cubic Meters	70,000.00 (91,556.54)	CM <sup>2</sup> (CY <sup>3</sup> )	\$16.70	\$1,169,000.00
0004AB	Over 70,000 Cubic Meters	69,547.00 (90,964.04)	CM (CY)	\$10.80	\$751,107.60
0005	Channel Excavation				
0005AA	First 70,000 Cubic Meters		0CM		\$0.00
0005AB	Over 70,000 Cubic Meters		0CM		\$0.00
0006	Riprap				
0006AA	First 5,000 Megagrams	5,000.00 (5,511.56)	MG <sup>4</sup> (Tons)	\$50.50	\$252,500.00
0006AB	Over 5,000 Megagrams	1,919.40 (2,115.78)	MG (Tons)	\$46.00	\$88,292.40
0007	Seeding		1LS		\$54,500.00
0008	Temporary Field Office		1LS		\$15,000.00
0008AA	Monthly Telephone Bills				
0008AB	First \$500.00	500.00	DL <sup>5</sup>	\$1.60	\$800.00
0009	Over \$500.00	1,967.78	DL	\$1.20	\$2,361.34
0010	Demobilization		1LS		\$82,000.00
0011	Channel Excavation Area A				
0011AA	First 18,000 Cubic Meters	18,000.00 (23,543.11)	CM (CY)	\$6.00	\$108,000.00
0011AB	Over 18,000 Cubic Meters	286.00 (374.07)	CM (CY)	\$5.50	\$1,573.00
0013	Channel Excavation Area C				
0013AA	First 6,000 Cubic Meters	6,000.00 (7,847.70)	CM (CY)	\$6.75	\$40,500.00
0013AB	Over 6,000 Cubic Meters	1,586.00 (2,074.41)	CM (CY)	\$6.00	\$9,516.00
0014	Remove Unknown Underwater Obstruction		1LS		\$0.00
0015	Rock Protection Dike	5,060.00 (5,577.70)	MG (Tons)	\$40.25	\$203,665.00
0016	Mobilization for Rock Protection Dike		1LS		\$21,479.76
0017	Demobilization for Rock Protection Dike		1LS		\$20,000.00
0018	Channel Excavation				

Item	Description	Quantity	U/M	Unit Price	Amount
0018AA	First 70,000 Cubic Meters	70,000.00 (91,556.54)	CM (CY)	\$11.02	\$771,400.00
0018AB	Over 70,000 Cubic Meters	9,345.00 (12,222.80)	CM (CY)	\$13.21	\$123,447.45
0019	Rock Quantity above 115% of 4400 MG	2,639.33 (2,909.36)	MG (Tons)	\$39.88	\$105,256.48
0020	Lump sum adjustment to account for contractor refund received		1LS		-\$0.18
<b>Subtotal Stage I</b>					<b>\$4,132,228.85</b>
Stage II, Mud Lake, Contract # W912EK-04-C-0007					
0001	Mobilization		1LS		\$575,000.00
0002	Embankment, Alignment A(Sta0+00A to Sta <sup>7</sup> 2+10A) and Alignment B (Sta 0+00B to Sta 3+28B)				0
0002AA	First 17,000 Cubic Meters	17,000 (22,235.16)	CM (CY)	\$14.60	\$248,200.00
0002AB	Over 17,000 Cubic Meters	5,462.66 (7,144.89)	CM (CY)	\$3.40	\$18,573.04
0003	Channel Excavation, Alignment C (Sta 0+72C to 28+16C)				
0003AA	First 98,400 Cubic Meters	98,400 (128,702.30)	CM (CY)	\$10.90	\$1,072,560.00
0003AB	Over 98,400 Cubic Meters	11,739.60 (15,354.82)	CM (CY)	\$2.60	\$30,522.96
0004	Channel Excavation, Alignments E, F, G, H, I, J, K, L, and N				
0004AA	First 32,500 Cubic Meters	31,655.61 (41,403.97)	CM (CY)	\$17.90	\$566,635.42
0004AB	Over 32,500 Cubic Meters		0CM		\$0.00
0005	Bedding Stone				
0005AA	First 5,300 Megagrams	5,300 (5,842.25)	MG (Tons)	\$31.00	\$164,300.00
0005AB	Over 5,300 Megagrams	598.99 (660.27)	MG (Tons)	\$18.30	\$10,961.52
0006	Riprap (180 Kg <sup>8</sup> )				
0006AA	First 12,400 Megagrams	12,400 (13,668.66)	MG (Tons)	\$35.00	\$434,000.00
0006AB	Over 12,400 Megagrams	2,420.75 (2,668.42)	MG (Tons)	\$21.00	\$50,835.75
0007	Riprap (275 Kg)				
0007AA	First 3,200 Megagrams	1,646.46 (1,814.91)	MG (Tons)	\$34.00	\$55,979.64
0007AB	Over 3,200 Megagrams		0MG		\$0.00
0008	Traffic Gate		1LS		\$6,000.00
0009	Seeding		0HA <sup>6</sup>		\$0.00
0010	Temporary Field Office		1LS		\$14,500.00
0011	Monthly Telephone Bills				
0011AA	First \$400.00		0DL		\$0.00
0011AB	Over \$400.00		0DL		\$0.00
0012	Demobilization		1LS		\$75,000.00
0013	Paint Access Gate		1LS		\$1007.14
0014	Seeding	9.67 (23.89)	HA (acres)	\$4,936.37	\$47,734.70
0015	Riprap (180 Kg)				
0015AA	First 600 Megagrams	600.00 (661.39)	MG (Tons)	\$62.00	\$37,200.00
0015AB	Over 600 Megagrams	32.55 (35.88)	MG (Tons)	\$45.00	\$1,464.75
0016	13 Additional Posts		1LS		\$3,806.42



Item	Description	Quantity	U/M	Unit Price	Amount
0017	Access Gate		1LS		\$8,447.46
0018	Riprap (180 Kg) Flow Inlet Size Reduction	833.57 (918.85)	MG (Tons)	\$60.58	\$50,497.67
0019	Stockpile (180 Kg) Riprap	50.00 (55.12)	MG (Tons)	\$34.00	\$1,700.00
0020	Bedding Stone 2+86A to 3+32A	56.43 (62.20)	MG (Tons)	\$46.85	\$2,643.75
0021	Riprap (180 Kg) 2+86A to 3+32A	114.19 (125.87)	MG (Tons)	\$46.85	\$5,349.80
<b>Subtotal Stage II</b>					<b>\$3,482,920.02</b>
<b>Construction Total</b>					<b>\$7,615,148.87</b>
<b>Real Estate</b>					<b>\$3,334.28</b>
<b>Definite Project Report</b>					<b>\$612,419.00</b>
<b>Plans and Specifications</b>					<b>\$74,488.43</b>
<b>Engineering and Design</b>					<b>\$60,200.81</b>
<b>Construction Management</b>					<b>\$144,946.97</b>
<b>PROJECT TOTAL</b>					<b>\$8,510,538.36</b>

<sup>1</sup>LS=Lump Sum

<sup>2</sup>CM=Cubic Meter

<sup>3</sup>CY=Cubic Yard

<sup>4</sup>MG=Megagram

<sup>5</sup>DL=Dollar

<sup>6</sup>HA=Hectare

<sup>7</sup>Sta=Station

<sup>8</sup>Kg=Kilogram

**5.3. Project Construction Modifications.** Eight recorded modifications to the Project have been completed.

**5.3.1.** Per USFWS request, a second access gate was added to the Project at Mud Lake. This gate is located northwest of the planned gate at the far northwest end of Embankment B as shown on Mud Lake Plate 33 (Sheet C7).

**5.3.2.** Riprap was also added along embankment areas of Mud Lake to prevent erosion and to minimize future maintenance costs. Mud Lake Plate 33 (Sheet C7) shows the location of the additional riprap labeled as "6".

**5.3.3.** A riprap dike was added to the existing submerged road bed at Sunfish Lake. This addition is shown on Plate 9 (Sheet C6) and is labeled as "1". Although this was not originally thought to be necessary during the planning phase, excessive erosion was observed during construction, which warranted the addition of the rock protection for the CDF.

**5.3.4.** Rock was placed at the southeast tip of Sunfish Lake during the Mud Lake contract.

**5.3.5.** The sediment trap was lengthened to compensate for the road bed at Sunfish Lake. This addition is shown on Plate 12 (Sheet C9) and Plate 22 (Sheet C19) and is labeled as "1" on both sheets.

**5.3.6.** Additional dredging was awarded at Sunfish Lake. This is shown on Plate 23 (Sheet C20) as Area A and Area C. It was dredged to an elevation of 182.0 meters.

**5.3.7.** A 50 Mg riprap stockpile was left at Mud Lake. This stockpile is shown on Plate 33 (Sheet C7) and is labeled as "7".

**5.3.8.** Additional riprap was added to the inlets at Mud Lake. The upper inlet was raised from 182.90 to 183.19 meters. The lower inlet was raised from 182.90 to 183.80 meters. This is shown on Plate 40 (Sheet C14) and is labeled as "8". The additional riprap was added to reduce the winter flow velocities to the backwater areas, which were found to be too high for overwintering fish.

**5.3.9.** Step channels were in the Sunfish Lake bid documents and awarded contract; however, as noted on Plate C18, this design was changed due to a value engineering proposal. The final constructed channel had smooth 3:1 slopes.

## 6. PROJECT PERFORMANCE

**6.1. Performance Monitoring and Assessment.** The purpose of this section is to summarize monitoring and data collection aspects of the Project. Table 6.1 shows the expected costs for performance monitoring and assessment. Table 6.2 presents the principle types, purposes, and responsibility of monitoring and data collection. Table 6.3 summarizes actual monitoring and data parameters grouped by Project phase, responsible agency, and data collection intervals. Drawings of the monitoring plan that has been established in the Project can be found in Appendix A, Plate 42. Changes to the monitoring plan should be coordinated with the USFWS, IADNR, WIDNR and the Corps.

**6.2. Post-Construction Monitoring.** Table 6.4 presents the post-construction monitoring plan. Monitoring includes both quantitative and qualitative data from federal and state agencies, research organizations, and the refuge manager. The monitoring parameters were developed to measure the effectiveness of the stated goals and objectives. Monitoring data, including annual field observations by the refuge manager, are used to evaluate the performance of the Project. The refuge manager should refer to Section 8, Project Operation, and the inspection checklist in Appendix D for a more complete description of the requested field observations.

**Table 6.1. Estimated Post-Construction Annual Monitoring Costs (April 2012 price levels)**

Item	Annual Cost
<b>Expected monitoring costs</b>	
Survey (Every 5 years)	\$40,000.00
Performance Report	\$40,000.00
Water Quality Monitoring	\$20,000.00
Subtotal	\$100,000.00
Contingencies (20%)	\$20,000.00
<b>Total</b>	<b>\$120,000.00</b>

**Table 6.2. Monitoring and Performance Evaluation Matrix**

<b>Project Phase</b>	<b>Type of Activity</b>	<b>Purpose</b>	<b>Responsible Agency</b>	<b>Implementing Agency</b>	<b>Funding Source</b>	<b>Remarks</b>
<b>Pre-Project</b>	Sedimentation Problem Analysis	Define system-wide problem. Evaluate planning assumptions.	USFWS	USGS <sup>1</sup> (UMESC <sup>2</sup> )	LTRM	--
	Pre-Project Monitoring	Identify and define problems at HREP site. Establish need of proposed project features.	Sponsors	Sponsors	Sponsors	--
	Baseline Monitoring	Establish baseline for performance evaluation.	Corps	Field Station or Sponsors through Cooperative Agreements or Corps	HREP / Sponsor	See Table 6.4 for implementation information.
<b>Design</b>	Data Collection for Design	Include quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	See Table 6.4 for implementation information
<b>Construction</b>	Construction Monitoring	Assess construction impacts; assure permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations.
<b>Post-Construction</b>	Performance Evaluation Monitoring	Determine success of project as related to objectives.	Corps (quantitative) / Sponsors (field observations)	Sponsors through O&M or Corps	HREP / Sponsors	See Tables 6.3 and 6.4 for the complete monitoring plan. See Table 6.4 for implementation information

<sup>1</sup>US Geological Survey

<sup>2</sup>Upper Mississippi Environmental Sciences Center

**Table 6.3. Post-Construction Monitoring Plan for Aquatic Habitat Features**

Goal – Enhance and Protect Aquatic and Backwater Habitat								
Objectives	Project Feature	Field Observations	Monitoring Activities by Government Agencies and Research Organizations	Suggested Unit of Measurement for Monitoring Activities	Year 0 Without Alternative	Year 1 Target With Alternative	Year 25 Target With Alternative	Year 50 Target With Alternative
Create off-channel deep-water areas to provide year-round habitat for centrarchids and associated species	Excavate channels in backwater areas	Describe presence or absence of fish stress or kills	Perform water quality tests at W-M589.3D, W-M589.0C, W-M588.1D, W-M588.0B at Mud Lake, W-M584.2X, W-583.5R, and E-M583.4P at Sunfish Lake	Winter water temperature [°C(°F)]	0.5 (32.9)	1.0 (33.8)	1.0 (33.8)	1.0 (33.8)
				Channel Water Depth [ha >1.2m (acre >3.9 ft)]	0	24.3 (60.0)	24.3 (60.0)	24.3 (60.0)
				Velocity [cm/sec (ft/min)] in Channels	>3.0 (>5.9)	0.3 (0.01)	0.3 (0.01)	0.3 (0.01)
				Catch per Unit Effort				
Reduce sedimentation in backwaters	Construct Deflection Embankments	Describe presence or absence of debris snags, channel sedimentation, or vegetation. Describe water clarity.	Perform water quality tests at stations listed above	Current velocity in backwater areas [cm/sec (ft/min)]	>3.0 (>5.9)	0	0	0
	Construct flow control structure	Presence of fish and fishing activity including fish kills	Fish surveys	Dissolved oxygen (mg/L)	3.0-5.0 (Mud Lake) 13.1 mg/L (Sunfish Lake)	>-5.0	>-5.0	>-5.0
	Sediment Trap	Describe presence of sediment in the trap.	Perform survey of channel depth	Depth (m)	183.0 m	179.8 m	181.31 m	183.0 m

## 7. MEMORANDUM OF AGREEMENT AND EXISTING RIGHT-OF-WAY

The Regional Director of the USFWS and the USACE, Rock Island District Engineer entered into a MOA on 28 May 2002, as required by EMP. A copy of the MOA is included as Appendix B of the O&M manual.

As set forth in the MOA with the USFWS, included in Appendix B, the USFWS has agreed to:

- Operate, maintain and repair the Project as defined in the Definite Project Report with Integrated Environmental Assessment, Pool 11 Islands, Iowa and Wisconsin Habitat Rehabilitation Project, dated September 2001, in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580.

## 8. PROJECT OPERATION

### 8.1. Operation Responsibilities.

**8.1.1. US Fish and Wildlife Service Responsibilities.** The USFWS is responsible for the operation and maintenance of all Project features in accordance with the Memorandum of Agreement and the environmental management regulations contained in Section 107(b) of WRDA 1992 (See Appendix C). The USFWS shall be responsible for developing and sustaining a program that will operate and maintain the Project and its features.

**8.1.2. US Army Corps of Engineers Responsibilities.** The USACE is responsible for administration of the EMP Rehabilitation Program in accordance with current laws and USACE policies.

**8.2. Project Features Requiring Operation.** This Project was designed to provide benefits with as little post-construction input from the sponsor as possible and thus has no general operating requirements, please see the maintenance section for all applicable requirements.

## 9. CONTACT INFORMATION

**9.1. Chain of Command.** The main point of contact for the Project is the McGregor Assistant District Manager, who in AUGUST 2012, was Clyde Male. The manager position is currently vacant. Additional people in the USFWS that have been listed as points of contact are the Environmental Engineer, Sharonne Baylor; Refuge Manager, Kevin Foerster; and Deputy Refuge Manager, Tim Yager. The chain of command for the USACE starts with the Lead EMP Engineer, who will be on site with the USFWS after a flood event. This person will pass information along to the EMP Program Manager. Contact information is available in Sections 9.2 and 9.3.

**9.2. Local Personnel.** The Project is managed by the USFWS. It is located in the Upper Mississippi River National Wildlife and Fish Refuge McGregor District which has its headquarters at 460 Business Highway 18 McGregor, IA 52157. The current Assistant District Manager is Clyde Male. USFWS is required to provide the USACE with a current listing of USFWS officials. It is the USFWS's responsibility to maintain and update this list accordingly. Updated information may be provided for inclusion into the annual inspection report. The following is a list of personnel as of AUGUST 2012. A list of area staff can be found at the following website: <http://www.fws.gov/midwest/UpperMississippiRiver/staff.html>.

**McGregor District**

Clyde Male  
Assistant Manager  
460 Business Highway 18  
McGregor, IA 52157

Office..... (563) 873-3423 X23  
Fax..... (563) 873-3803  
Email ..... clyde\_male@fws.gov

**Upper Mississippi River National Wildlife and Fish Refuge**

Kevin Foerster  
Refuge Manager  
51 East 4<sup>th</sup> Street  
Winona, MN 55987  
<http://www.fws.gov/Midwest/uppermississippiRiver/staff.html>

Office..... (507) 494-6218  
Fax..... (507) 452-0851  
Email ..... Kevin\_foerster@fws.gov

Tim Yager, Deputy Refuge Manager ..... (507) 494-6219  
E-mail ..... Timothy\_Yager@fws.gov

Sharonne Baylor, Environmental Engineer ..... (507) 494-6207  
E-mail ..... Sharonne\_Baylor@fws.gov

**9.3.State and Federal Personnel.** The following is a list of State and Federal emergency response personnel as of AUGUST 2012.

**US Army Corps of Engineers**

Clock Tower Building  
PO Box 2004  
Rock Island IL 61204-2004  
Website – <http://www.mvr.usace.army.mil>  
Website – <http://www.rivergages.com>

Marvin Hubbell, UMRR-EMP Regional Program Manager ..... (309) 794-5428  
Email ..... marvin.e.hubbell@usace.army.mil  
Kara Mitvalsky, Environmental Engineering Lead..... (309) 794-5623  
Email ..... kara.n.mitvalsky@usace.army.mil

**National Weather Service – Quad Cities, IA/IL Weather Forecast Office (Dubuque County)**

9050 Harrison Street  
Davenport Municipal Airport  
Davenport, IA 52806-7326  
Website – <http://www.crh.noaa.gov/dvn/>  
Rainfall and River Stage Forecasts ..... (563) 386-3976

**Iowa Department of Natural Resources**

PO Box 250  
Guttenberg, IA 52031  
Website – <http://www.iowadnr.gov/>

Scott Gritters ..... (563) 252-1156  
E-mail ..... [Scott.Gritters@dnr.iowa.gov](mailto:Scott.Gritters@dnr.iowa.gov)

24143 Hwy 52  
Bellevue, IA 52031

Kirk Hansen ..... (563) 872-4976  
E-mail ..... [Kirk.Hansen@dnr.iowa.gov](mailto:Kirk.Hansen@dnr.iowa.gov)

Michael Steuck ..... (563) 872-4976  
E-mail ..... [Michael.steuck@dnr.iowa.gov](mailto:Michael.steuck@dnr.iowa.gov)

206 Rose St  
Bellevue, IA 52031

Michael Griffin ..... (563) 872-5700  
E-mail ..... [Michael.griffin@dnr.iowa.gov](mailto:Michael.griffin@dnr.iowa.gov)

**Wisconsin Department of Natural Resources**

2550 Mormon Coulee Rd  
La Crosse WI 54601  
Website – <http://dnr.wi.gov/>

Jeff Janvrin ..... (608) 785-9005  
E-mail ..... [Jeff.janvrin@wisconsin.gov](mailto:Jeff.janvrin@wisconsin.gov)

**10. MAINTENANCE AND INSPECTION**

**10.1. Maintenance.** An active preventative maintenance program reduces damage to existing Project features by taking early corrective action. Additional costs associated with repair and rehabilitation are also avoided. An effective preventative maintenance program requires regular, thorough inspections. Routine inspections can aid USFWS officials in discovering deficiencies within the Project. They can also provide USFWS officials with baseline condition data. This data is necessary for considering repair options for major damage within the Project. Steps will be taken by the refuge manager to correct conditions disclosed by Project inspections or joint inspections. Regular maintenance repair measures will be accomplished during the appropriate season as scheduled by the refuge manager to ensure structure serviceability. Table 10.1 establishes an estimated operation and maintenance cost for the Project. The cost assumes that approximately five percent of the project would be in need of maintenance every ten years.

**Table 10.1. Estimated Annual O&M Costs (August 2012 Price Levels)**

Item	Quantity	Unit	Unit Price	Total Cost
<b>Operation</b>	0			\$0
<b>Maintenance</b>				
Embankment Inspection	40	Hr	\$38.20	\$1,528
Riprap	200	MG	\$107.04	\$21,408
Erosion Control	80	Hr	\$152.60	\$12,208
Debris Removal, Weirs	80	Hr	\$76.30	\$6,104
Planting Maintenance	16	Ha	\$3,210.00	\$51,360
Maintenance Dredging	2,500	CM	\$8.75	\$21,875
Rehabilitation <sup>1</sup>				\$0
			<b>Subtotal</b>	<b>\$114,483</b>
Contingencies				\$22,897
<b>Total</b>				<b>\$137,380</b>
<sup>1</sup> Rehabilitation cannot be accurately measured. Rehabilitation is the reconstructive work that significantly exceeds the annual O&M requirements identified above and that is needed as a result of major storms or flood events. (Definite Project Report, Table 8-2, September 2001)				

**10.1.1. Barriers and Gates.** The refuge manager shall make Project inspections of the wooden post barrier and gate at least once per year. Any degradation of quality or displacement of posts and erosion shall be noted. Replacement of posts may be necessary to maintain the general state of the barrier feature for the life of the Project. The gate will need to be sanded and painted as necessary to prevent damage and rusting. Steps should be taken to remedy adverse conditions disclosed by the inspections.

**10.1.2. Channel Maintenance.** The refuge manager shall make annual observations of the dredged portions of Sunfish and Mud Lakes to determine the approximate depth. The refuge manager shall make periodic inspections to observe any significant sedimentation. Fish activity and fish kills shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections. USFWS is not required to dredge these channels.

**10.1.3. Erosion Control.** The refuge manager shall make annual observations of the embankments and other vegetated surfaces. The refuge manager shall make periodic inspections to observe any significant erosion. Rills and washouts shall be reported. Also, any adverse conditions such as undesirable debris, waste materials, and unauthorized structures shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections.

**10.1.4. Removal of Debris and Unwanted Structures.** The refuge manager shall make annual observations of the sites to look for debris, wastes and unwanted structures. The refuge manager shall make periodic inspections to observe any significant problems. These problems shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections.

**10.1.5. Vegetation Management.** While growth of trees may be beneficial throughout much of the project, the deflection embankment should be managed to ensure the project will function as



designed. Damage from the root wads of large trees felled by a flood or wind event could compromise this project feature, particularly in areas with high erosion potential or where the deflection embankment section is narrow. Suggested methods for management include; girdling trees larger than 12 inches in diameter; spraying to minimize growth in riprap; hinge cutting trees under 12 inches in diameter to create additional habitat where tops of trees could land in aquatic areas; and removing trees that develop on the crown of the embankment, especially in narrow areas.

**10.1.6. Control of Unauthorized Activities.** The refuge manager shall make periodic inspections to observe any signs of unauthorized activities. Illegal All Terrain Vehicle (ATV) use and other such problems shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections.

**10.2. Inspections.** An active maintenance program is based on inspections and subsequent servicing, adjustment, or repair. An effective maintenance program ensures Project serviceability by timely and thorough inspections, thereby avoiding or reducing maintenance costs. Also, by documenting the condition of the Project, a baseline for consideration of rehabilitation can be established for Project damage resulting from a major storm or flood event. The two types of inspections for the Project are: (1) Project inspections by the refuge manager and (2) joint inspections by the refuge manager and the USACE. A blank inspection form is shown in Appendix D. Should any improvements or modifications be made to the Project, additional instructions may become necessary for proper operation and maintenance.

#### **10.2.1. Routine Inspections.**

**10.2.1.1. US Fish and Wildlife Service.** The Project inspection should be performed by the refuge manager or an appropriate representative for the purpose of noting routine deficiencies and initiating corrective actions. This inspection will be performed at periods not exceeding 12 months and will follow inspection guidance presented in subsequent sections of this manual. It is suggested that the inspection be conducted every May, which is representative of after-spring flood conditions. Additional Project inspections should occur as necessary after high water events or as scheduled by the refuge manager. A Project inspection checklist has been developed as presented in Appendix D. It is suggested that the refuge manager shall furnish a copy of the completed checklist to the U.S. Army Corps of Engineers, Rock Island District, ATTN: EMP Project Manager, CEMVR-PM-M, Clock Tower Building, P.O. Box 2004, Rock Island, Illinois 61204-2004, immediately following each Project inspection.

**10.2.1.2. US Army Corps of Engineers.** A joint inspection by the refuge manager and the Corps shall be made in accordance with the Memorandum of Agreement. The purpose of this inspection is to assure that adequate maintenance is being performed as presented in the DPR and this manual. The District Engineer or authorized representative should have access to all portions of the constructed Project upon coordination with the refuge manager for this purpose. After a routine inspection, the USACE shall provide the USFWS with a copy of the CEI report. The USFWS must file any response or objections to the USACE inspection rating with the USACE District Engineer. The response must include pertinent engineering data, such as plans and schedules for correcting all reported deficiencies. The USACE will maintain records of all inspection reports for a minimum of ten fiscal years, or longer if warranted or needed for historical purposes.

**10.2.1.3. Iowa and Wisconsin Departments of Natural Resources.** Both the Iowa and Wisconsin DNRs are project cooperators. If damages to the Project occur, it is recommended to notify both DNR offices.

**10.2.1.4. Post-Flood Reports.** The refuge manager, shall request a joint inspection with the Corps immediately following a specific storm or flood event which causes damage exceeding the annual O&M as specified in this manual and the DPR. It is recommended to notify the project cooperators as well. The Project inspections by the refuge manager and joint inspections results will be the basis for determining maintenance responsibility and potential rehabilitation by the Corps. USFWS shall compile a post-flood report and forward one copy to the USACE District Engineer, indicating in writing an official request for assistance if needed. This report shall serve as a request for assistance to receive rehabilitation support from the USACE under the EMP program. The report shall include:

- A complete history of the flood event, including any damages sustained to the Project;
- All operation and maintenance logs;
- A daily tabulation of river stages (river stages can be calculated by installing a gauging station, checking the nearest river gage, or using a level rod off the side of the bridge);
- A discussion of pertinent factors in operating and maintaining the Project, such as problems encountered during operation and maintenance, weather conditions (including ice effects), damage incurred, and repairs required;
- A summary of the number, time, and cost of manpower and the quantities and costs of supplies and equipment the risk management effort required;
- Any other useful information.

**10.2.2. Inspection Timeline.** Table 10.2 presents a general guideline of the proposed schedules for inspection of the Project. The actual schedule will vary due to unforeseen conflicts, individual schedule constraints, and weather.

<u>Timeframe</u>	<u>Action</u>
Spring/early summer 45 days after inspection	USACE and USFWS joint, post-flood season inspection
Late summer/fall 45 days after inspection	USFWS forwards report to USACE
After all major flood events	USACE and USFWS joint, post-flood event damage inspection

**10.3. Project Encroachments and Modifications.** 33 USC 408 (Section 408) provides authority solely to the Secretary of the Army for modifications or alterations to USACE projects. According to Army policy, there is very limited delegated authority to District Commanders to approve minor, low impact modifications to projects operated and maintained by sponsors.

Approval from the District Engineer of the USACE, Rock Island District is required prior to any minor improvement or change in any feature of the Project. In addition, no encroachment shall be made on Project rights-of-way without prior determination that the proposed work will not adversely affect the Project. Before starting work on any such improvements, changes, or encroachments, USFWS officials shall submit for consideration and approval a complete set of the proposed plans to the US Army Corps of Engineers, Rock Island District, ATTN: CEMVR-EC-DN. After a sufficient review period, the USACE shall notify the USFWS by letter of the findings and if approval is granted. If approval is granted, and after the work is completed, the USFWS will update the O&M manual to reflect the modification to the Project and provide a copy to the CEMVR-EC-DN. Additionally, the sponsor shall furnish the USACE drawings, which show the new "as-built" condition.

**10.4. As-Built Construction Drawings.** The drawing, included in Appendix A, depict as-built or as-repaired Project features.

## **11. REPAIR, REPLACEMENT & REHABILITATION**

Repair, Replacement and Rehabilitation (RR&R) actions are to conform to the Project as-builts unless otherwise approved by the USACE, as required in Section 10.3 of this O&M manual. As stated in the Memorandum of Agreement between the USFWS and the Corps (Appendix B), the Department of the Army is responsible for the Federal share of any mutually agreed upon rehabilitation of the Project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

Should inspection of the Project area following a major flood or natural disaster disclose substantial damage to any of the major components of the Project that appears to exceed the annual O&M as specified in this manual and the DPR, the Corps and the USFWS shall meet and discuss the appropriate course of action in light of the original Project design. The inspections by the refuge manager (as summarized in the submitted checklist) and the joint inspections with the Corps will be the basis for determining maintenance responsibility by the USFWS versus potential rehabilitation by the Corps. Repair of damage attributable to lack of maintenance is a USFWS responsibility.

The options of rehabilitation or abandonment of the Project may be considered at such time that damage exceeds O&M requirements. Any decision would be carried forth only upon written mutual agreement of the USFWS and the Corps. Included within such agreement would be a description of the agreed-upon course of action and funding responsibilities, if any.

**11.1. Repairs.** Repairs are those activities of a routine nature that maintain the Project in good condition after it has been damaged by a flood event.

**11.2. Replacement.** Replacement covers features that no longer operate or function as designed and must be replaced.

**11.3. Rehabilitation.** Rehabilitation refers to a set of activities necessary to restore the Project to its pre-flood event condition.

**OPERATION AND MAINTENANCE MANUAL  
POOL 11 ISLANDS  
SUNFISH LAKE AND MUD LAKE  
HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

**MISSISSIPPI RIVER MILES 583.3 TO 593.0  
DUBUQUE COUNTY, IOWA AND GRANT COUNTY, WISCONSIN**

**AUGUST 2012**

**A  
P  
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**PROJECT PLATES**

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**Title**

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**Plate 43**

**Sunfish Lake Transects**

**Plate 44**

**Mud Lake Transects**

**Plate 45**

**Mud Lake Transects**



**GENERAL PROJECT NOTES**

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEAL LEVEL 1912 (MSL 1912).
2. THE MAJORITY OF SUNFISH LAKE IS A STUMP FIELD. DUE CONSIDERATION MUST BE GIVEN TO THE DIFFICULTIES OF NAVIGATING AND DREDGING IN SUCH CONDITIONS.
3. WATER DEPTHS IN THE SUNFISH LAKE PROJECT AREA VARY FROM 0 - 2.5 METERS. AT FLAT POOL ELEVATION, THE AVERAGE DEPTH IS APPROXIMATELY 1 METER. FLOATING PLANT ACCESS TO THE PROJECT AREA MAY REQUIRE DREDGING.
4. SURVEY DATUM: ILLINOIS WEST NAD 83, METERS.
5. MUD LAKE SURVEYING BENCHMARKS SHOWN ON SHEET X4.

**GOALS**

THE GOALS OF THE POOL 11 ISLANDS HABITAT REHABILITATION AND ENHANCEMENT PROJECT (HREP) ARE TO:

1. RESTORE BACKWATER HABITAT BY REDUCING SEDIMENTATION, AND PROVIDING PROTECTION AGAINST WIND-INDUCED WAVE FORCES THAT CAUSE SEDIMENT RESUSPENSION.
2. CREATE DEEP WATER AQUATIC HABITAT.

**SUNFISH LAKE OBJECTIVES**

THE OBJECTIVES OF THE PROJECT ARE TO:

1. CONSTRUCT A 1568-METER EMBANKMENT TO DEFLECT RIVER FLOWS AWAY FROM THE SUNFISH LAKE AREA BREAK UP WIND-INDUCED WAVES.
2. CONSTRUCT A 10-HECTARE SYSTEM OF DEEP-WATER CHANNELS FOR FISH HABITAT.

**CHANNEL EXCAVATION NOTES (SUNFISH LAKE)**

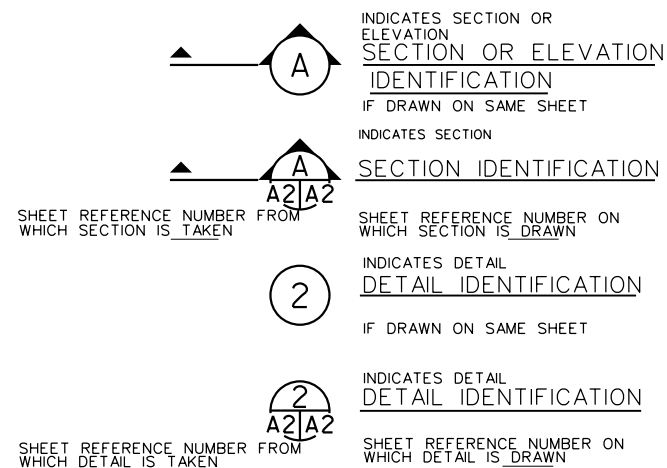
1. THE ESTIMATED CAPACITY OF THE CDF, ALLOWING FOR 1.6 METERS OF FREEBOARD, IS APPROXIMATELY 100,000 CUBIC METERS. THE ESTIMATED QUANTITY OF MATERIAL TO BE EXCAVATED FROM ALIGNMENTS D-M IS APPROXIMATELY 80,000 CUBIC METERS. THE CONTRACTOR'S CHANNEL EXCAVATION PLAN MUST ADDRESS HOW EFFLUENT WATER QUALITY STANDARDS WILL BE MET, GIVING CONSIDERATION TO THE CAPACITY OF THE DISPOSAL FACILITY AND THE AMOUNT OF MATERIAL TO BE DREDGED. IF NECESSARY, THE PLAN MAY INCLUDE, BUT NOT BE LIMITED TO: ALTERNATING PERIODS OF DREDGING AND DECANTING; ADDITION OF CHEMICAL FLOCCULANTS; BUCKET/AUGER DREDGING; AND/OR DE-WATERING OF SEDIMENTS.
2. THE CONTRACTOR MUST MAINTAIN AT LEAST 1 METER OF FREEBOARD ABOVE THE WATER SURFACE IN THE CDF AT ALL TIMES, UNLESS OTHERWISE DIRECTED BY THE CONTRACTING OFFICER.

**MUD LAKE OBJECTIVES**

THE OBJECTIVES OF THE PROJECT ARE TO:

1. CONSTRUCT A 2965-METER EMBANKMENT TO DEFLECT RIVER FLOWS AWAY FROM THE MUD LAKE AREA BREAK UP WIND-INDUCED WAVES.
2. CONSTRUCT A 8.8-HECTARE SYSTEM OF DEEP-WATER CHANNELS FOR FISH HABITAT.

**LEGEND**



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

Symbol	Description	Date	Approved
AS	AS CONSTRUCTED	27 JUL 04	REH

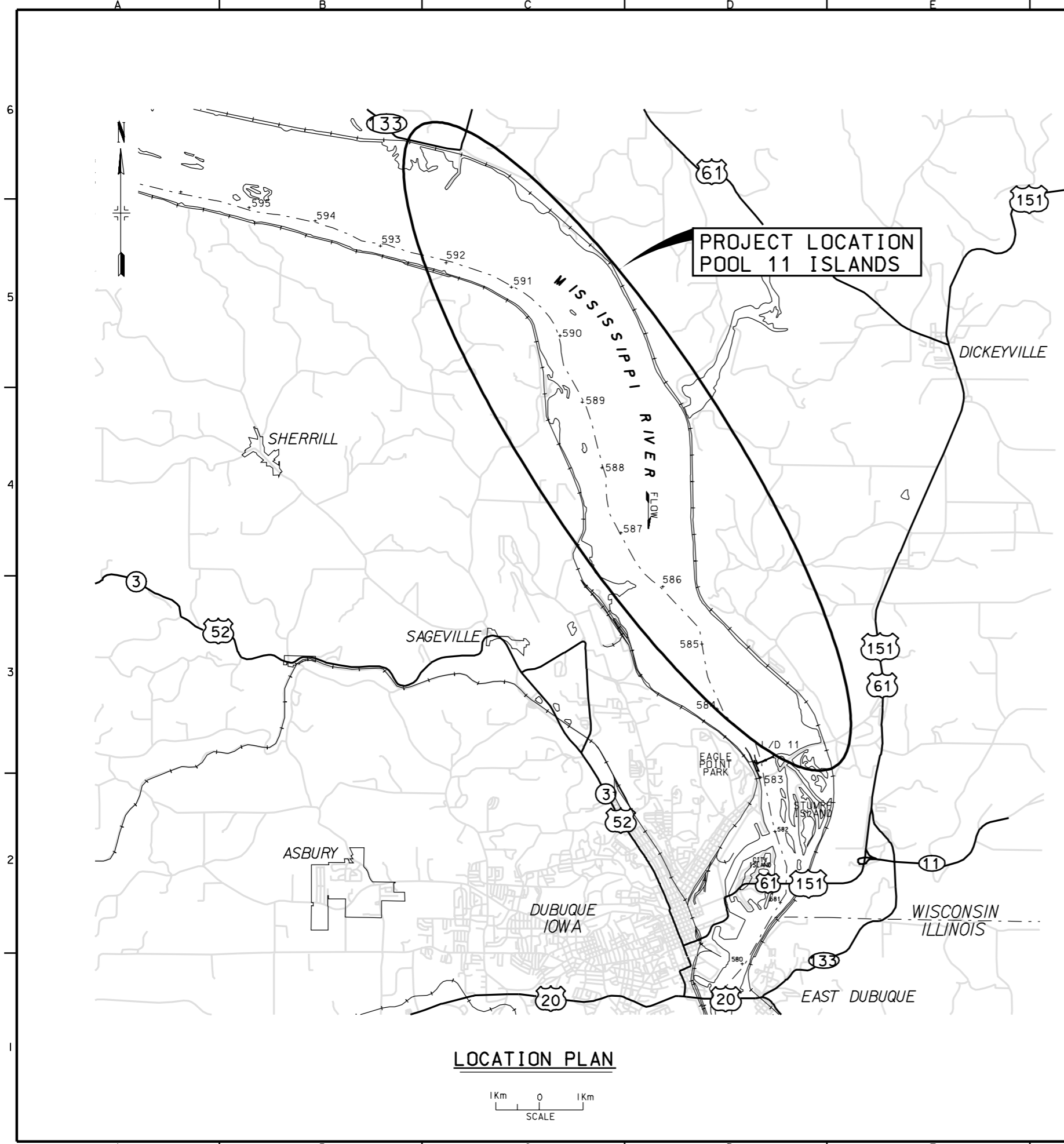
Designated By:	Date:
RTN	21 SEP 2002
SDB	AS SHOWN
MJA	EP66
DJH	DACW25-02-R-0008

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

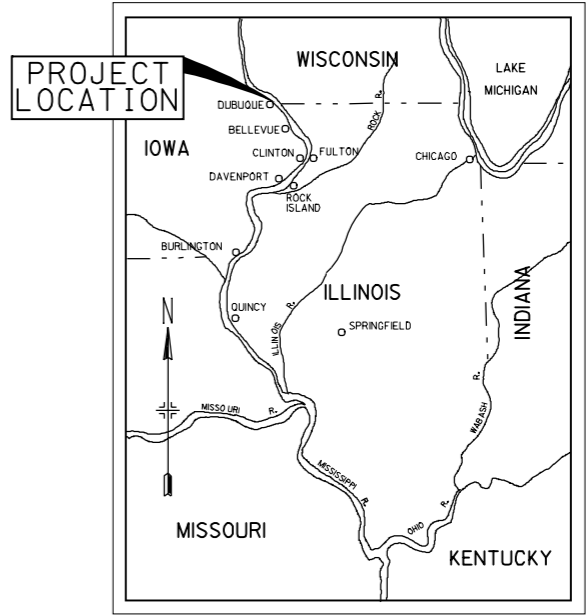
POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE

**INDEX OF DRAWINGS  
& PROJECT DESCRIPTION**

Sheet Reference Number:  
**X2**  
Sheet 2 of 25



**LOCATION PLAN**



**VICINITY MAP**  
40 0 40 80 120  
SCALE IN KILOMETERS



Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designated By: RTN	Date: 16 SEP. 2001
Drawn By: SDB/TPD	Scale: AS SHOWN	
Checked By: KGB	Drawing Code:	
Reviewed By: DJH	Soil/Terrain Number:	

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT  
PROGRAM POOL 11  
RIVER MILES 583-594  
**LOCATION PLAN  
AND VICINITY MAP**

**PLATE 1**  
**PLATE 2**

ALL DISTANCES, MEASUREMENTS AND  
ELEVATIONS SHOWN ARE IN METERS  
UNLESS NOTED OTHERWISE.



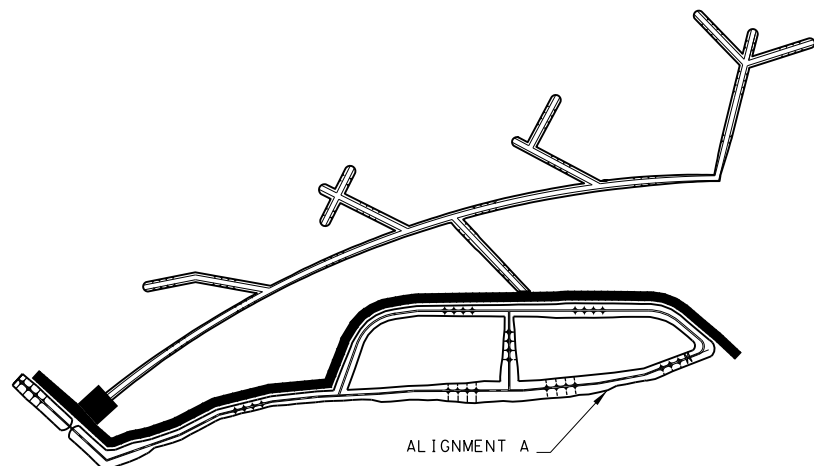
**CONSTRUCTION FEATURES**

THE FOLLOWING PROVIDES A BRIEF DESCRIPTION OF THE MAJOR PROJECT FEATURES. IT IS NOT NECESSARILY A CONSTRUCTION SEQUENCE.



**FEATURE: DEFLECTION EMBANKMENT**

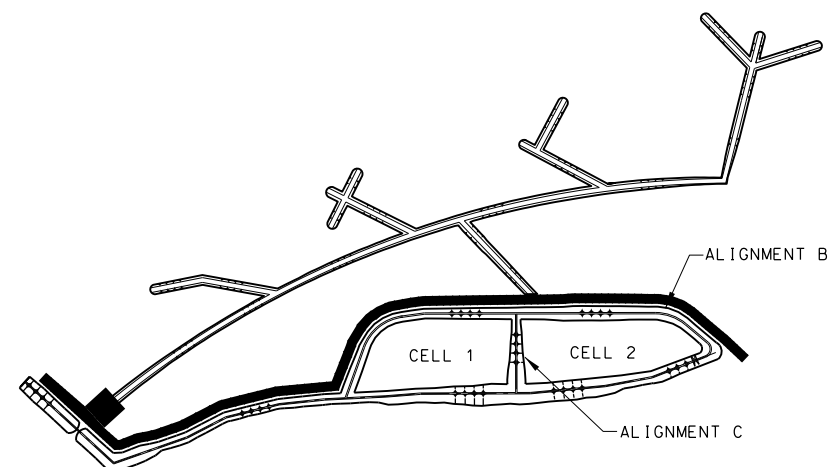
(ALIGNMENT A) CONSTRUCT DEFLECTION EMBANKMENT USING ADJACENT BORROW FROM RIVER BED.



BORINGS INDICATE THE RIVERBED CONSISTS PRIMARILY CLAYS. THE COMPOSITION OF THE MATERIAL REQUIRES THAT EXCAVATION AND PLACEMENT BE ACCOMPLISHED MECHANICALLY, USING A 3 CUBIC METER BUCKET (MINIMUM), TO MAINTAIN IN-SITU SOIL STRENGTH.

**FEATURE: CONFINED DISPOSAL FACILITY**

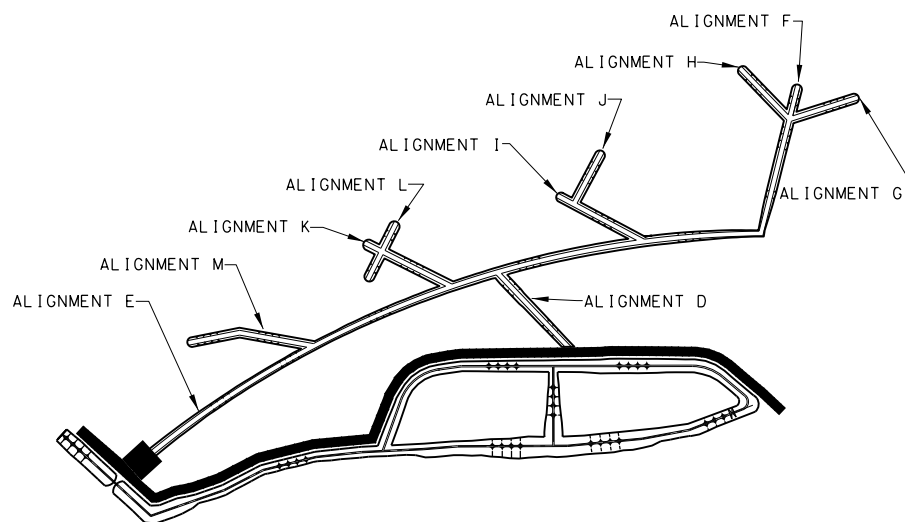
(ALIGNMENTS B & C) CONSTRUCT A TWO-CELL CONFINED DISPOSAL FACILITY (CDF) USING ADJACENT BORROW FROM THE RIVERBED.



EMBANKMENT FOR THE CDF MUST ALSO BE PLACED MECHANICALLY USING A 3 CUBIC METER BUCKET (MINIMUM).

**FEATURE: DEEP WATER FISH HABITAT**

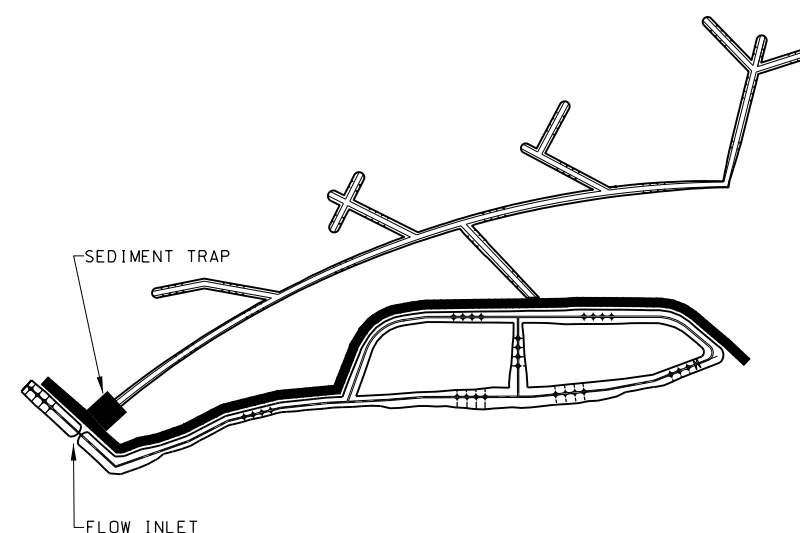
CONSTRUCT A SYSTEM OF DEEP-WATER CHANNELS FOR FISH HABITAT.



THE EXCAVATED CHANNEL RESULTING FROM EMBANKMENT BORROW OPERATIONS (ALIGNMENTS A & B) WILL PROVIDE APPROXIMATELY 3.8 HECTARES OF FISH HABITAT. THE REMAINING 6.2 HECTARES OF FISH HABITAT CHANNELS (ALIGNMENTS D-M) MAY BE EXCAVATED BY HYDRAULIC PIPELINE DREDGE, BUCKET/AUGER DREDGE, CLAMSHELL DREDGE, OR OTHER SUITABLE MEANS ACCEPTABLE TO THE GOVERNMENT. ALL EXCAVATED MATERIAL FROM CHANNELS D-M MUST BE PLACED IN THE CDF. SEE GENERAL NOTES FOR INFORMATION REGARDING CAPACITY OF CDF ON SHEET X2.

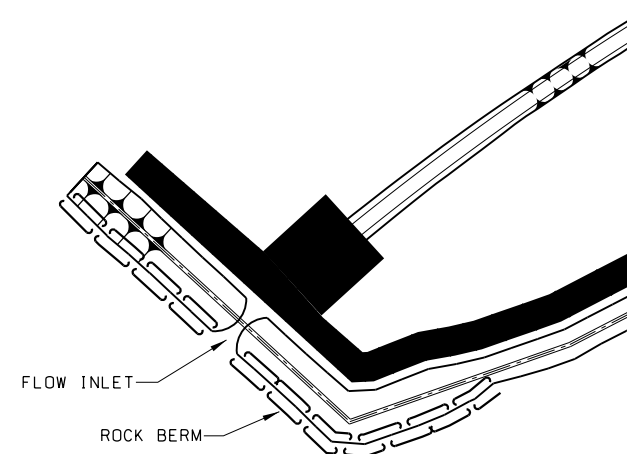
**FEATURE: FLOW INLET AND SEDIMENT TRAP**

CONSTRUCT A FLOW INLET IN THE DEFLECTION EMBANKMENT TO ALLOW NOMINAL FLOW THROUGH THE NEWLY EXCAVATED CHANNELS. PLACE RIPRAP TO PROTECT THE INLET FROM EROSION. FLOW INLET DETAILS MAY BE FOUND ON SHEET C19. DIRECTLY DOWNSTREAM OF THE FLOW INLET, EXCAVATE A SEDIMENT TRAP. SEDIMENT TRAP DETAILS MAY BE FOUND ON SHEET C19.



**FEATURE: RIPRAP BERM**

CONSTRUCT A ROCK BERM ALONG THE UPSTREAM TOE OF THE NEW EMBANKMENT, FROM STA 0+00 TO STA 3+50.



Symbol	Description	Revisions
AS CONSTRUCTED		
27JUL04JRP/REH	Date	Approved

Designed By: RTN	Date: 21 SEP 2002
Drawn By: SDB	Scale: AS SHOWN
Checked By: MJA	Drawing Code: EPE66
Reviewed By: DJH	Specification Number: DACW25-02-R-0008

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CONSTRUCTION FEATURES**

Sheet Reference Number:  
**X4**  
Sheet 4 of 25

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

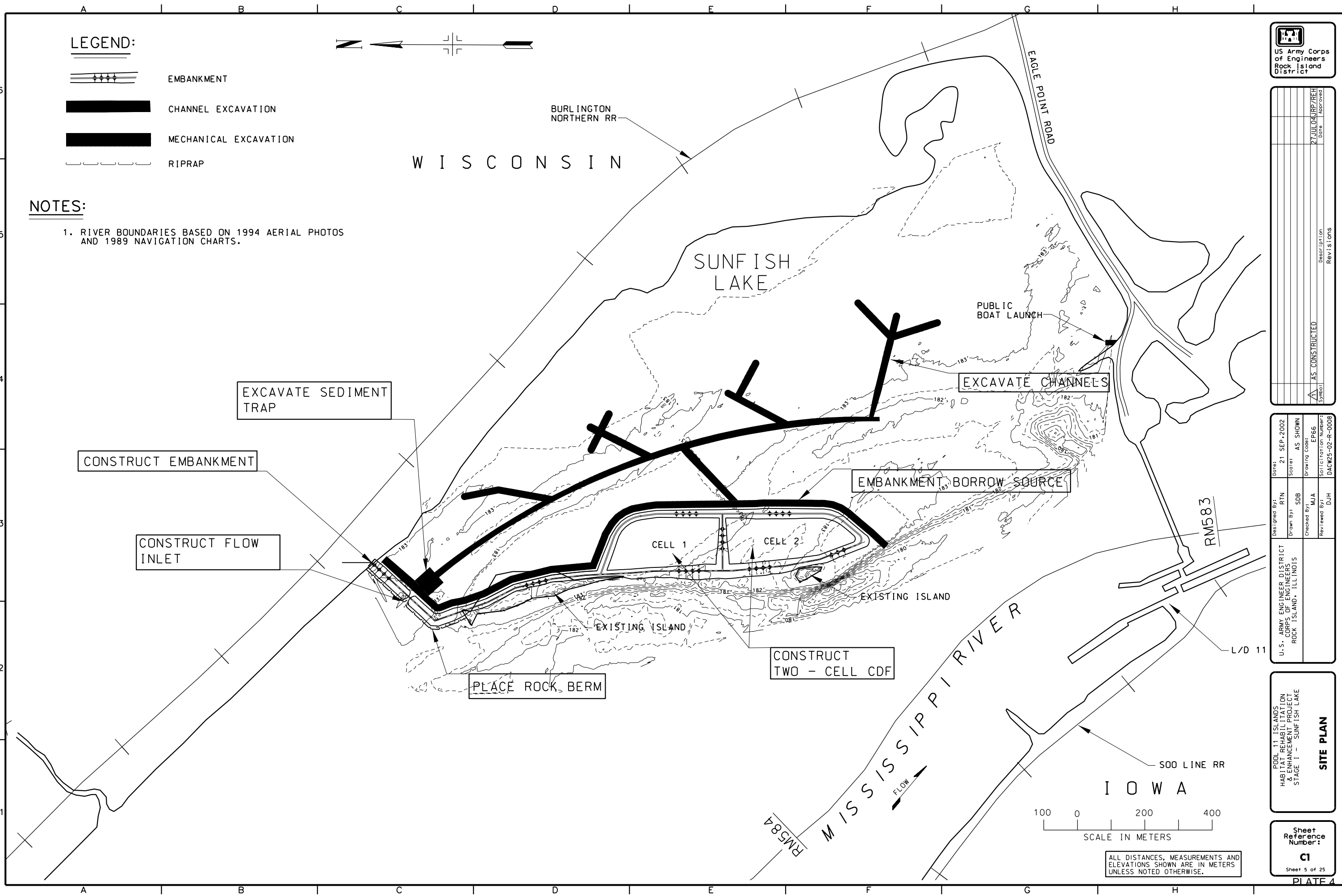
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AS CONSTRUCTED		27 JUL 04	JRP/REH

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

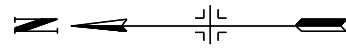
U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE





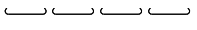
Sheet Reference Number:  
**C1**  
Sheet 5 of 25



A B C D E F G H



**LEGEND:**

-  BORING LOCATION
-  EMBANKMENT
-  CHANNEL EXCAVATION
-  MECHANICAL EXCAVATION
-  RIPRAP

**NOTES:**

1. RIVER BOUNDARIES BASED ON 1994 AERIAL PHOTOS AND 1989 NAVIGATION CHARTS.



Symbol	Description	Revisions
AS	CONSTRUCTED	27 JUL 04 JRP/ZREH Date Approved

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	NNM	Drawing Code:	EP66
Reviewed By:	DJH	Soil Citation Number:	DACW25-02-R-0008

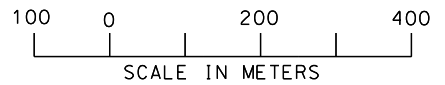
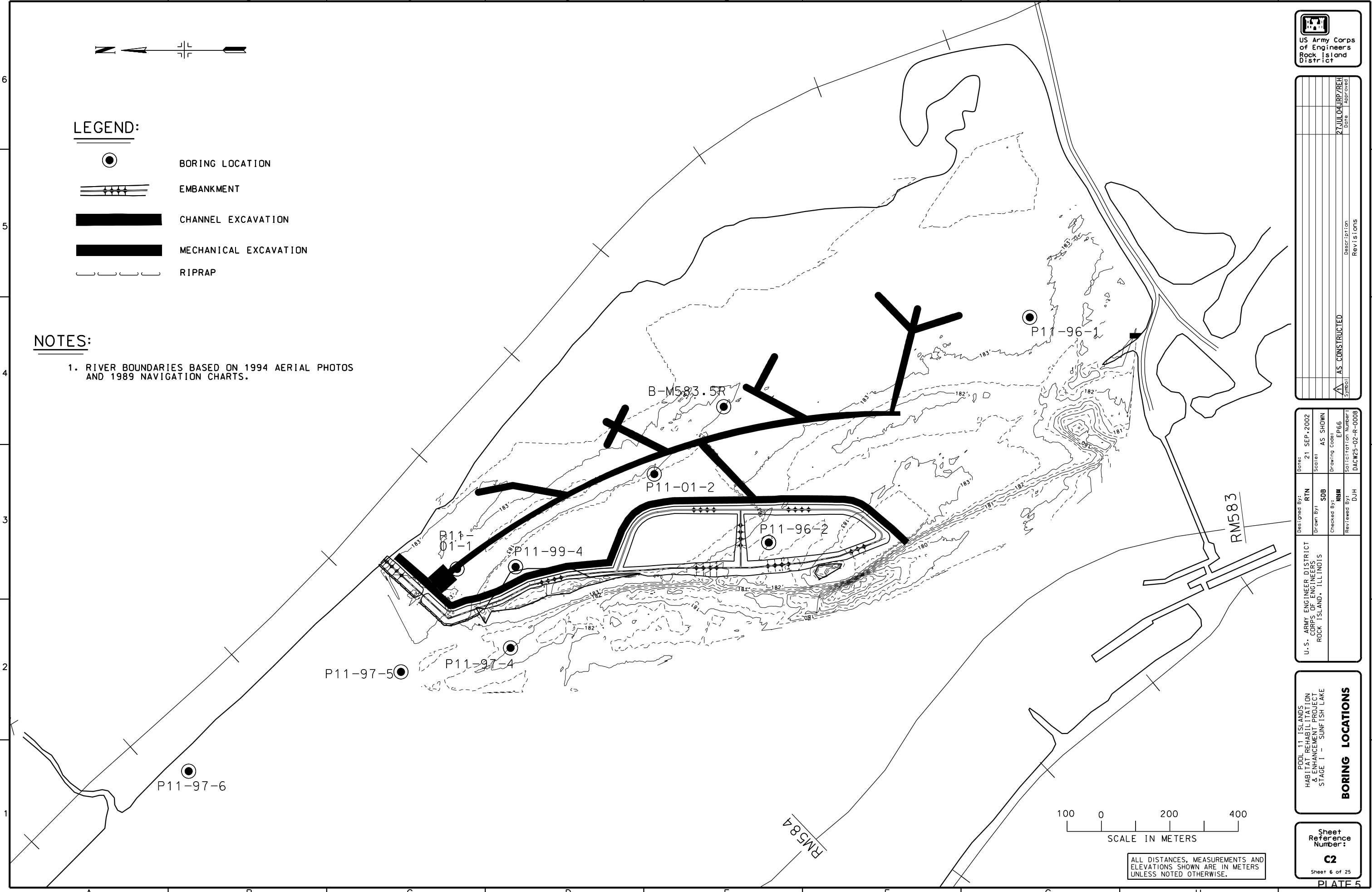
U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND DISTRICT

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE

**BORING LOCATIONS**

Sheet Reference Number:  
**C2**  
Sheet 6 of 25

PLATE 5



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

A B C D E F G H

22:44:03 27 SEP 2002 11:13:44 22:44:03 27 SEP 2002 11:13:44



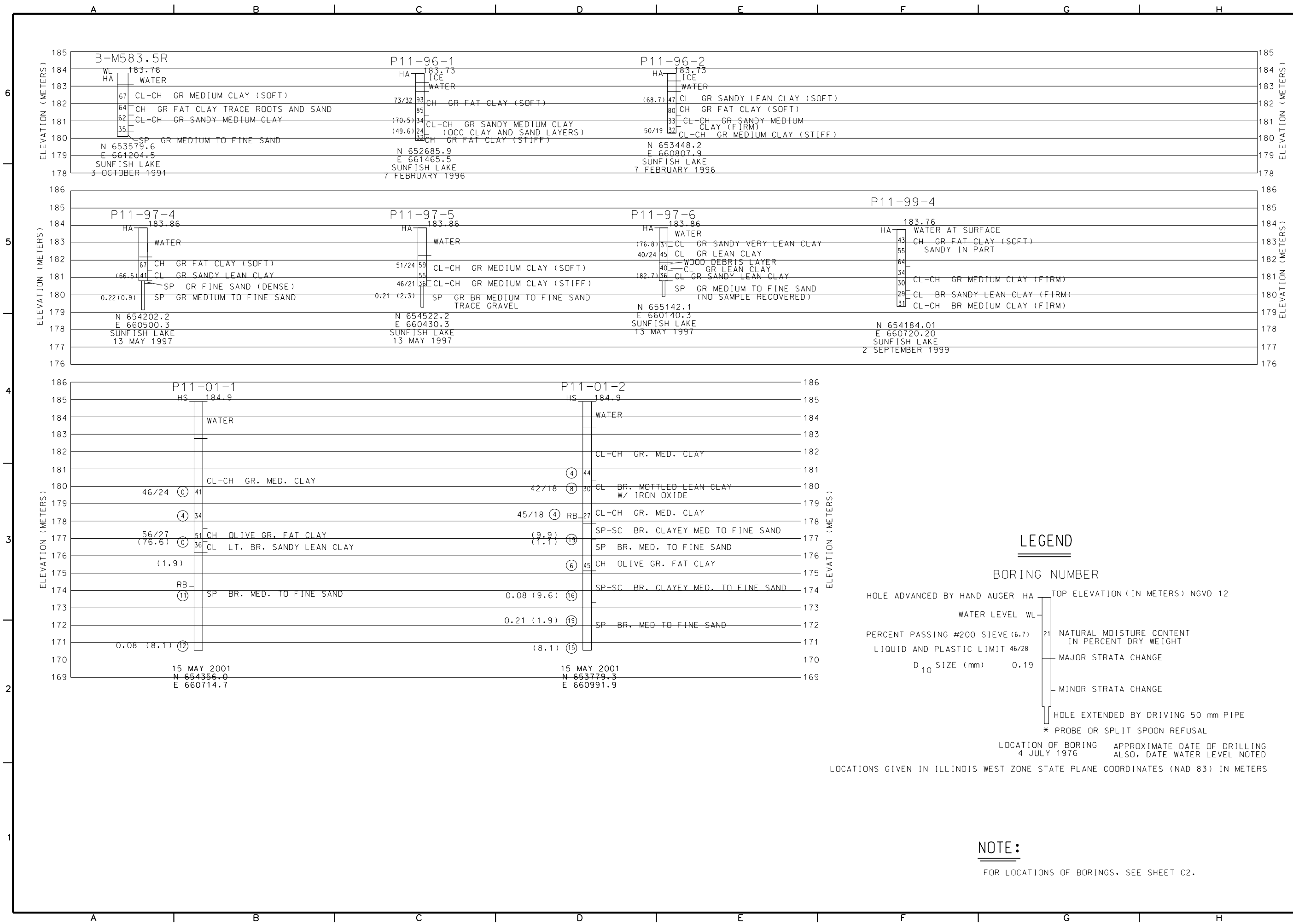
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AS	CONSTRUCTED	27 JUL 04	JRP/REH

Designed By:	RSK	Date:	21 SEP 2002
Drawn By:	CJK	Scale:	AS SHOWN
Checked By:	TEM	Drawing Code:	EP66
Reviewed By:	SAZ	Soil Test Report Number:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE

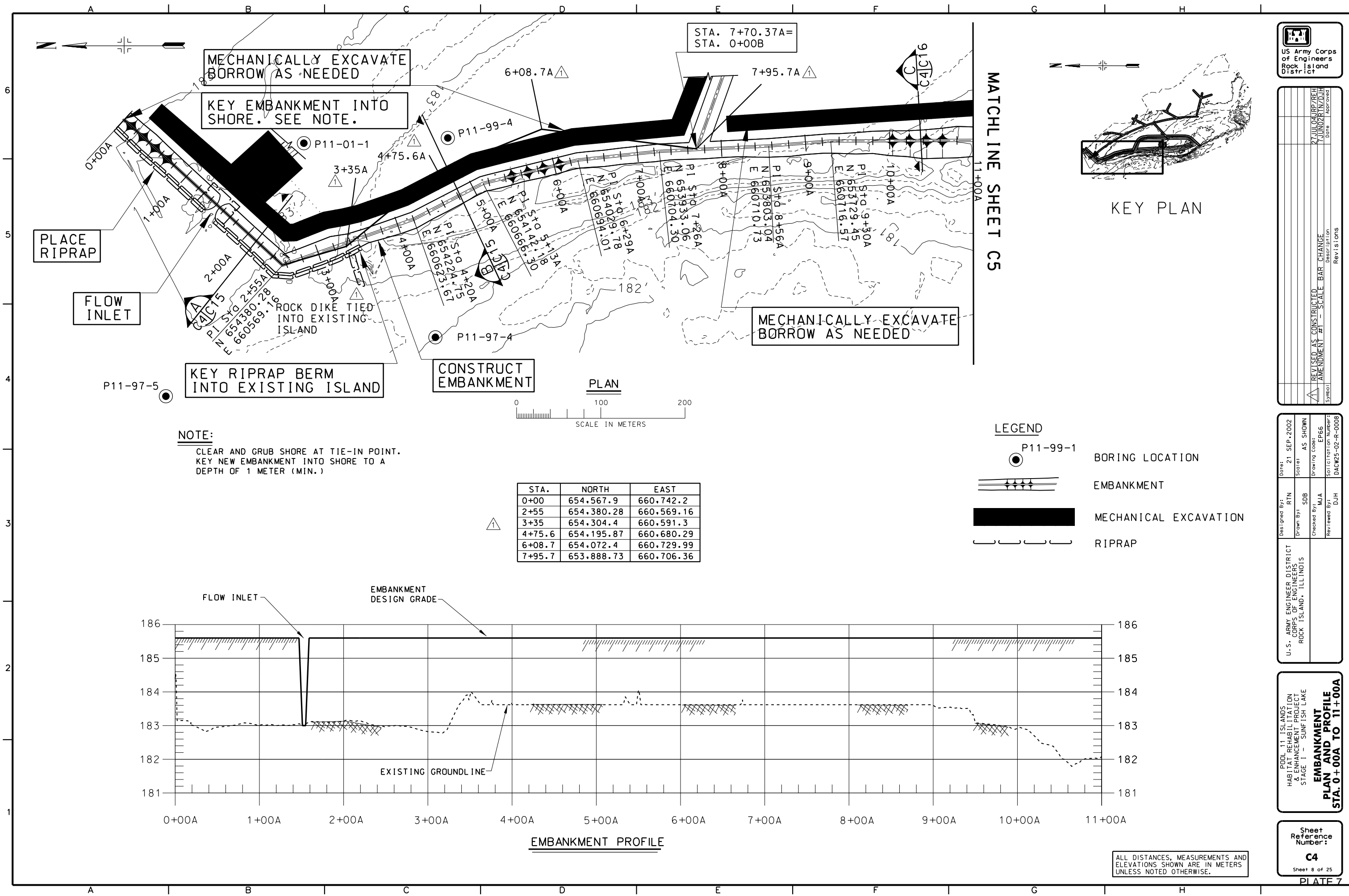
**BORING LOGS**

Sheet Reference Number:  
**C3**  
Sheet 7 of 25



**NOTE:**  
FOR LOCATIONS OF BORINGS, SEE SHEET C2.

04-11-18 AM  
22:41:01 sec  
13 sep 2006  
ep66easbu1175.ep66c03.dgn



MECHANICALLY EXCAVATE BORROW AS NEEDED

KEY EMBANKMENT INTO SHORE. SEE NOTE.

PLACE RIPRAP

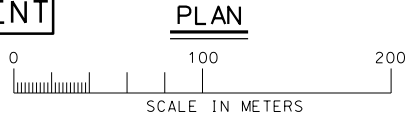
FLOW INLET

KEY RIPRAP BERM INTO EXISTING ISLAND

CONSTRUCT EMBANKMENT

MECHANICALLY EXCAVATE BORROW AS NEEDED

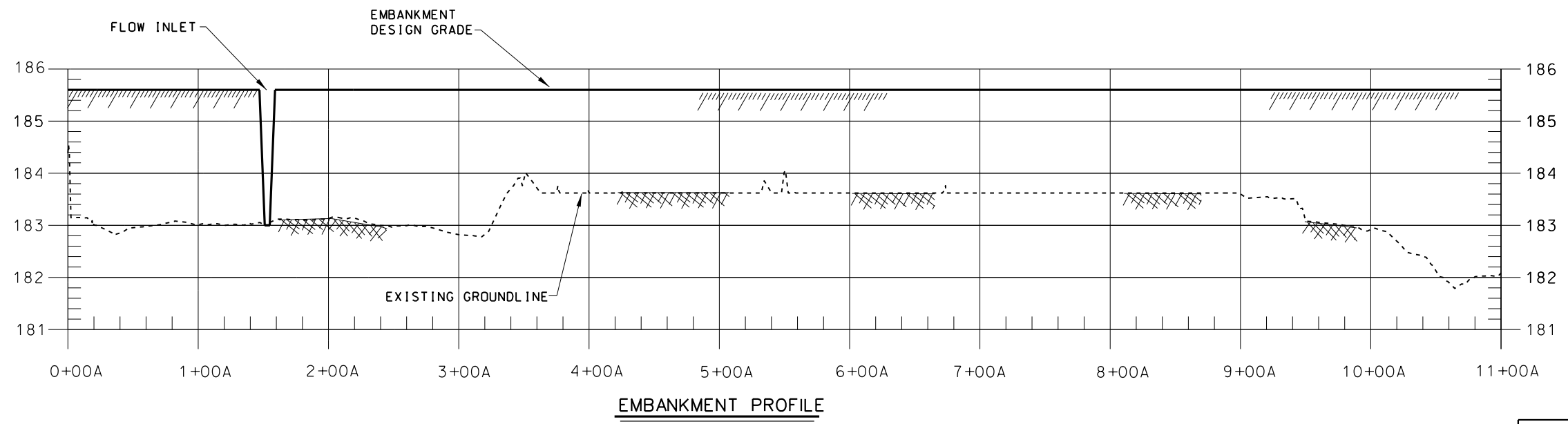
**NOTE:**  
 CLEAR AND GRUB SHORE AT TIE-IN POINT. KEY NEW EMBANKMENT INTO SHORE TO A DEPTH OF 1 METER (MIN.)



STA.	NORTH	EAST
0+00	654,567.9	660,742.2
2+55	654,380.28	660,569.16
3+35	654,304.4	660,591.3
4+75.6	654,195.87	660,680.29
6+08.7	654,072.4	660,729.99
7+95.7	653,888.73	660,706.36

**LEGEND**

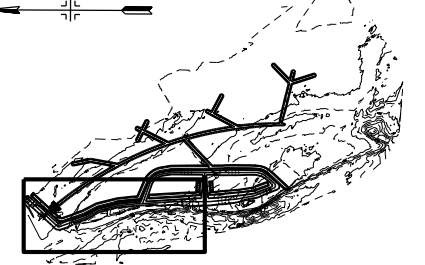
- P11-99-1 BORING LOCATION
- EMBANKMENT
- MECHANICAL EXCAVATION
- RIPRAP



**EMBANKMENT PROFILE**

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

MATCHLINE SHEET C5



**KEY PLAN**



Symbol	Description	Date	Approved
△	REVISED AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	7 JUN 02 R/INZ/DJH	
		27 JUL 04 R/REP/ZREH	

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Soil Condition Number:	DACW25-02-R-0008

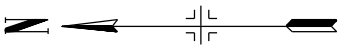
U.S. ARMY ENGINEER DISTRICT  
 CORPS OF ENGINEERS  
 ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
 HABITAT REHABILITATION  
 & ENHANCEMENT PROJECT  
 STAGE 1 - SUNFISH LAKE  
**EMBANKMENT  
 PLAN AND PROFILE  
 STA. 0+00A TO 11+00A**

Sheet Reference Number:  
**C4**  
 Sheet 8 of 25  
 PLATE 7

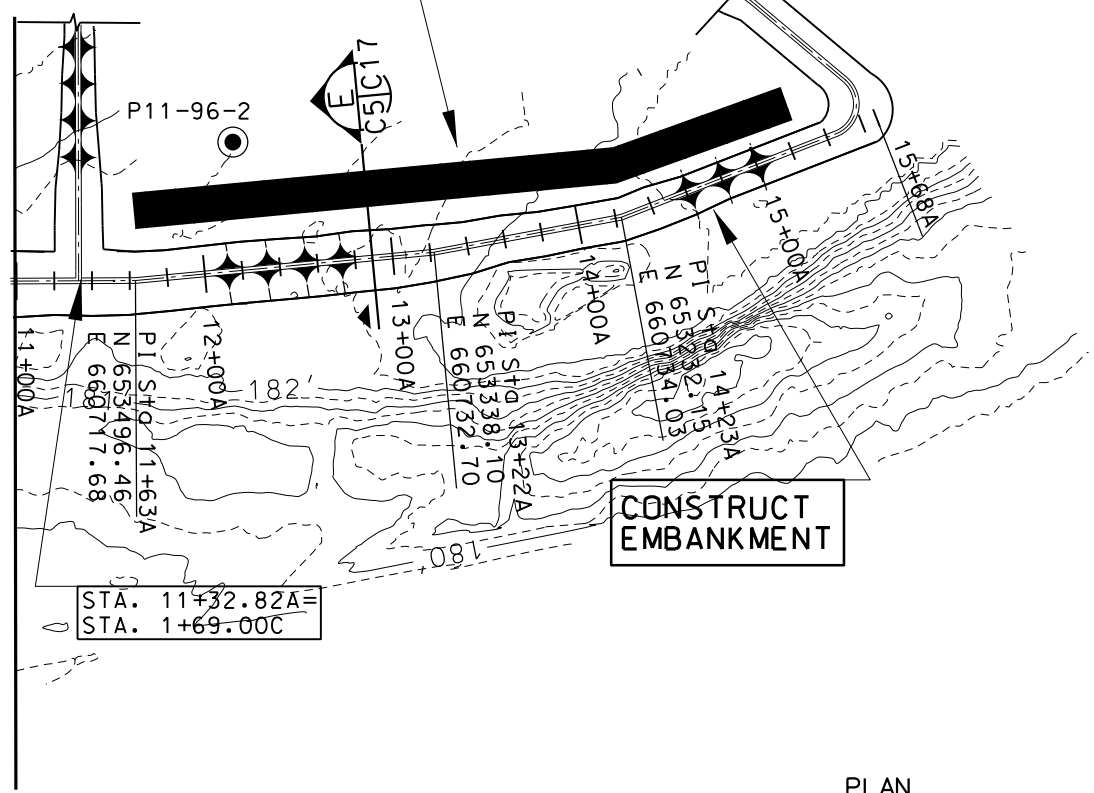
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A B C D E F G H



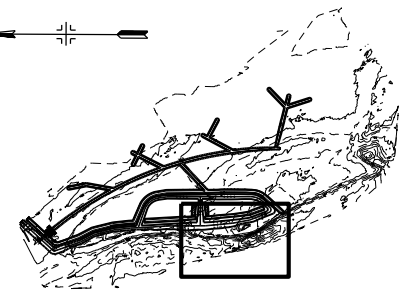
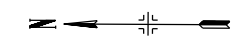
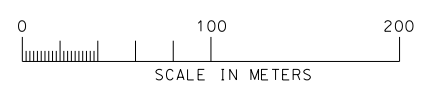
MECHANICALLY EXCAVATE BORROW AS NEEDED

MATCHLINE SHEET C4



CONSTRUCT EMBANKMENT

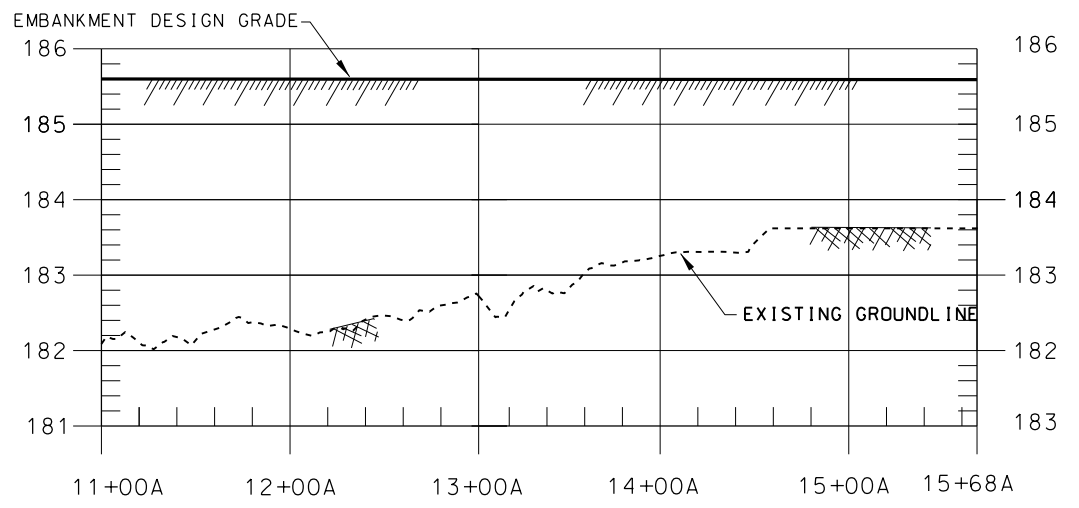
PLAN



KEY PLAN

LEGEND

- P11-99-1 BORING LOCATION
- EMBANKMENT
- MECHANICAL EXCAVATION



EMBANKMENT PROFILE

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



Symbol	Description	Revisions
△	AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	
		27 JUL 04 JRP/ZRH 7 JUN 02 RIN/DJH Date Approved

Designed By: RTN	Date: 21 SEP 2002
Drawn By: SDB	Scale: AS SHOWN
Checked By: MJA	Drawing Code: EP66
Reviewed By: DJH	Specification Number: DACW25-02-R-0008

POOL 11 ISLANDS HABITAT REHABILITATION & ENHANCEMENT PROJECT STAGE 1 - SUNFISH LAKE  
**EMBANKMENT PLAN AND PROFILE STA. 11+00A TO 15+68A**

Sheet Reference Number:  
**C5**  
 Sheet 9 of 25

PLATE 8

A B C D E F G H

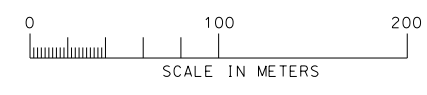
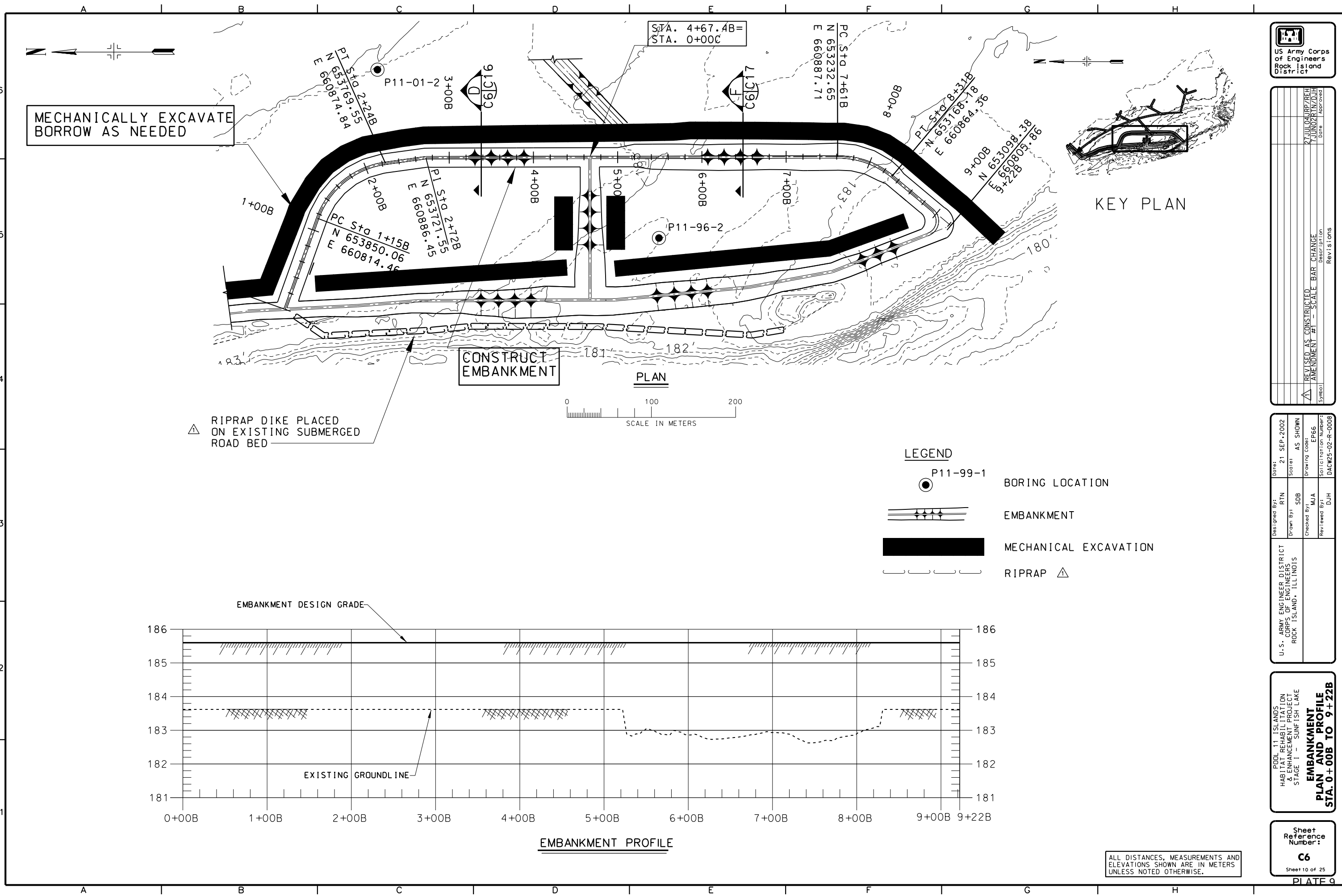
Symbol	Description	Date	Approved
△	REVIS AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27JUL04JRH/7REH	
		7JUN02RIN/DJH	

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

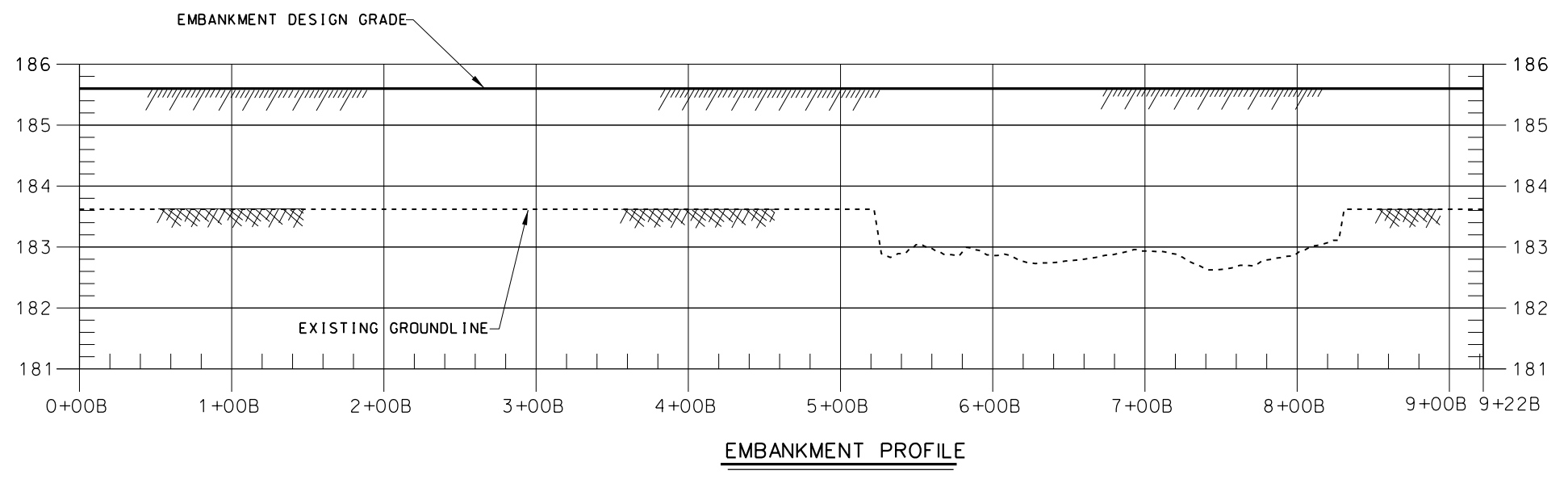
POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**EMBANKMENT  
PLAN AND PROFILE  
STA. 0+00B TO 9+22B**

Sheet Reference Number:  
**C6**  
Sheet 10 of 25  
PLATE 9



**LEGEND**

- P11-99-1 BORING LOCATION
- EMBANKMENT
- MECHANICAL EXCAVATION
- RIPRAP △



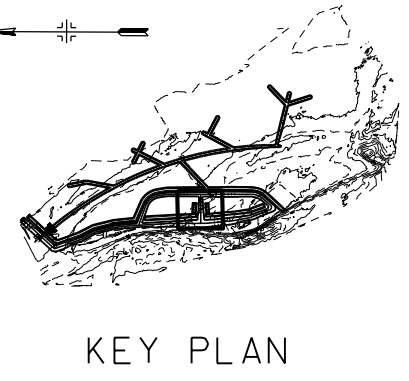
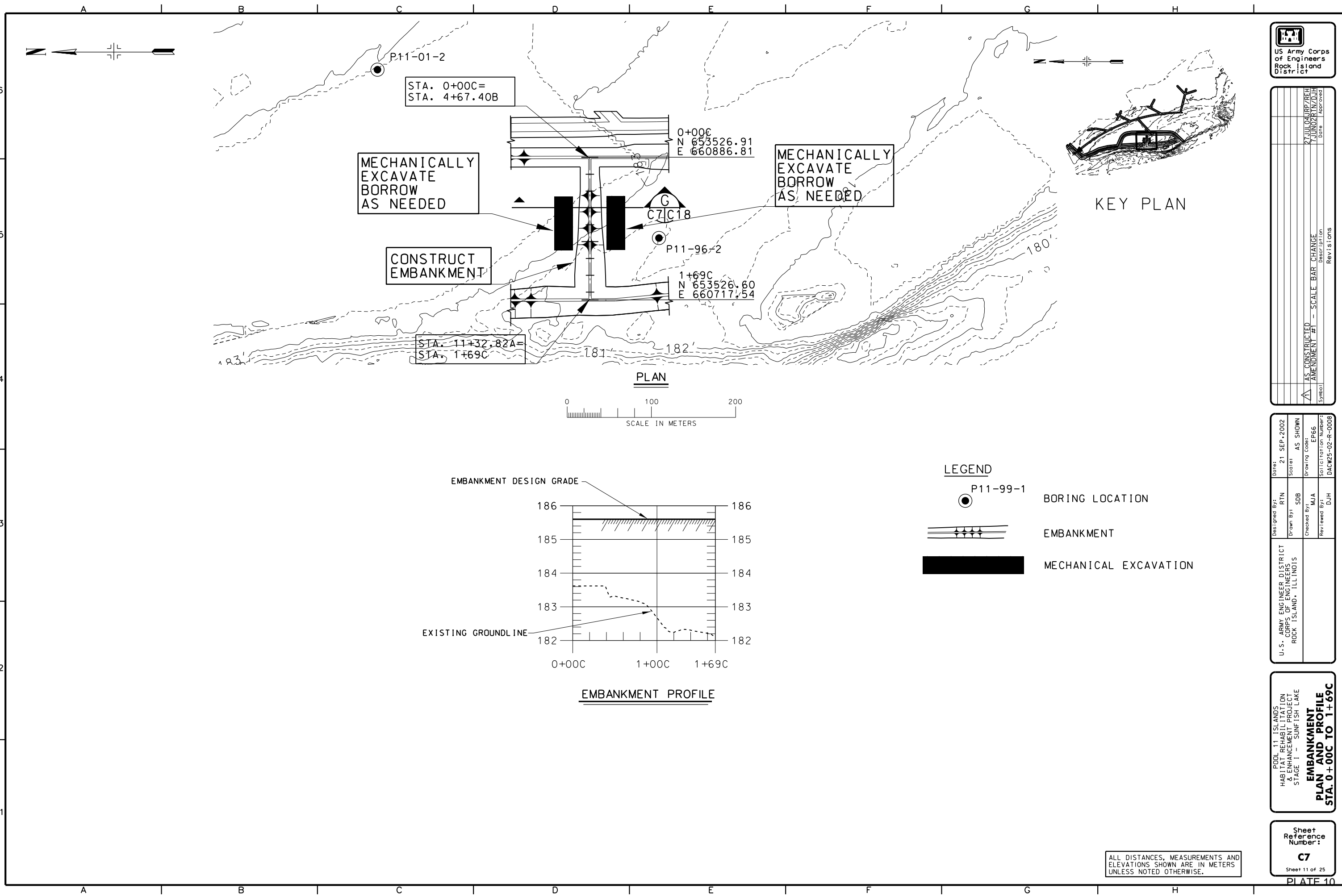
ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

Symbol	Description	Date	Approved
▲	AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27JUL04/RP/ZRH	
		7JUN02/RN/DJH	

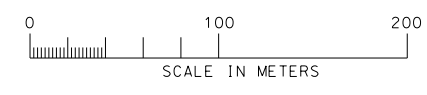
Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Symbol:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**EMBANKMENT  
PLAN AND PROFILE  
STA. 0+00C TO 1+69C**

Sheet Reference Number:  
**C7**  
Sheet 11 of 25

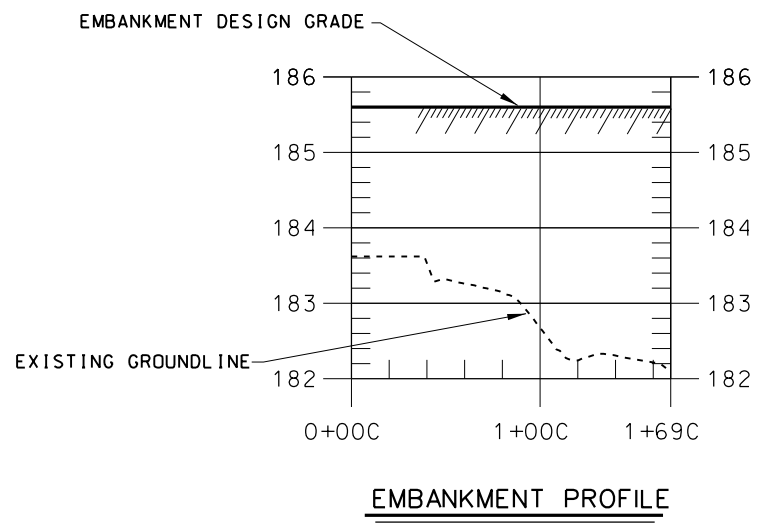


PLAN



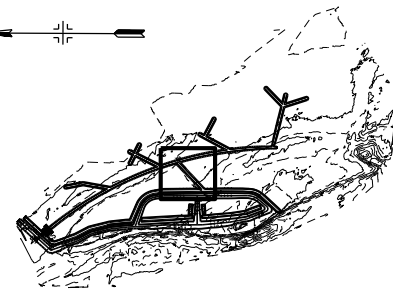
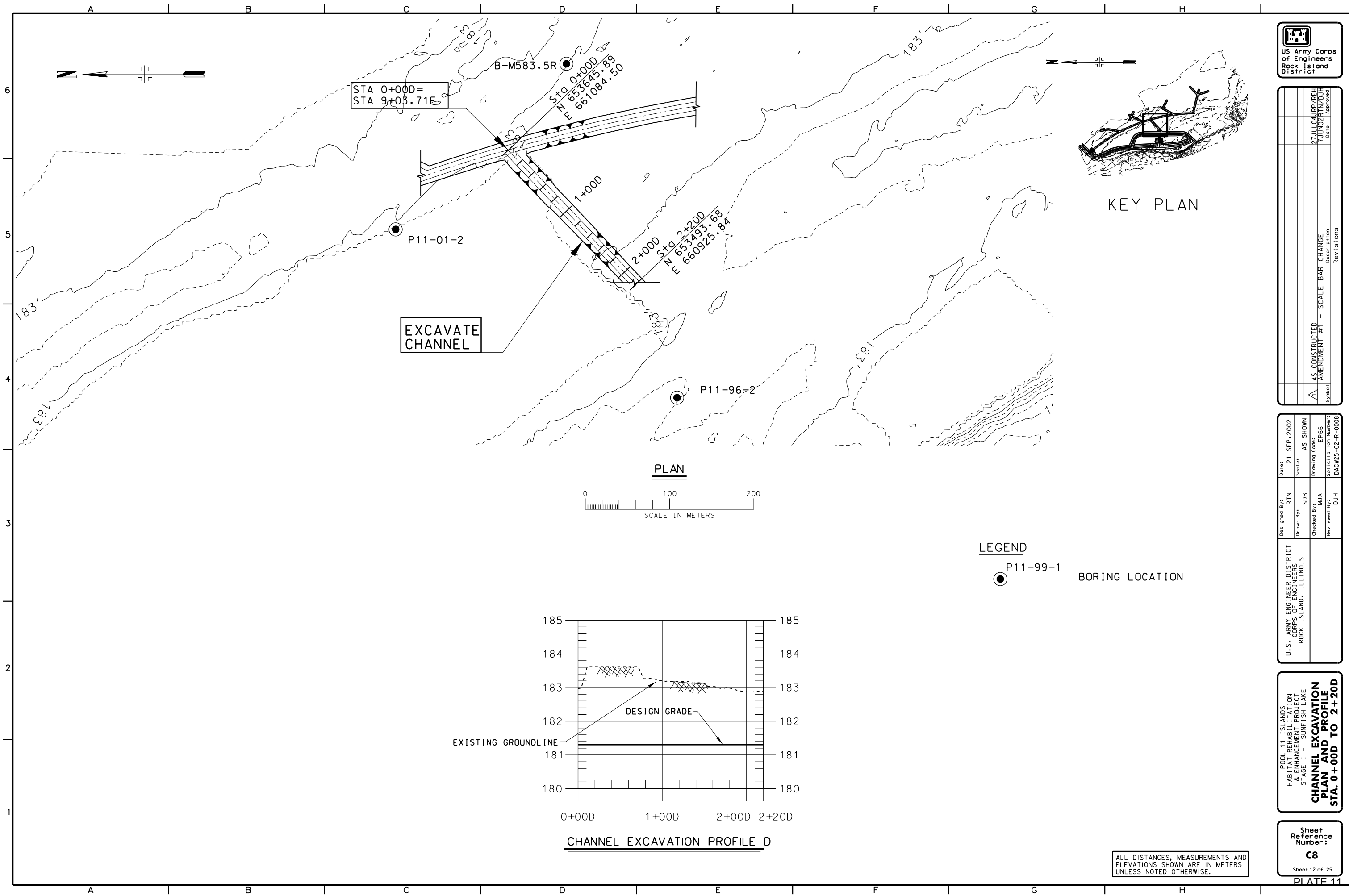
LEGEND

- P11-99-1 BORING LOCATION
- EMBANKMENT
- MECHANICAL EXCAVATION

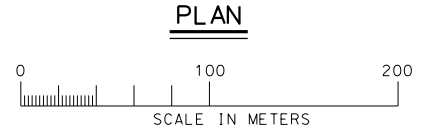


ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

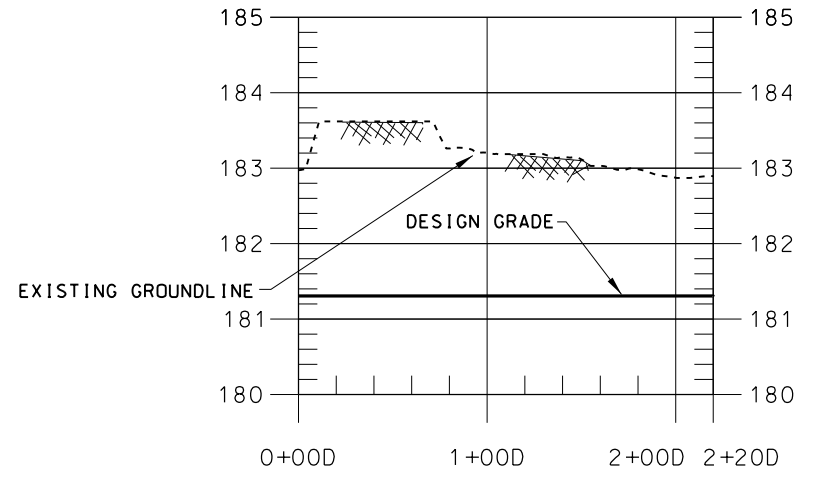




KEY PLAN

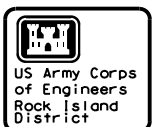


**LEGEND**  
 P11-99-1 BORING LOCATION



CHANNEL EXCAVATION PROFILE D

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



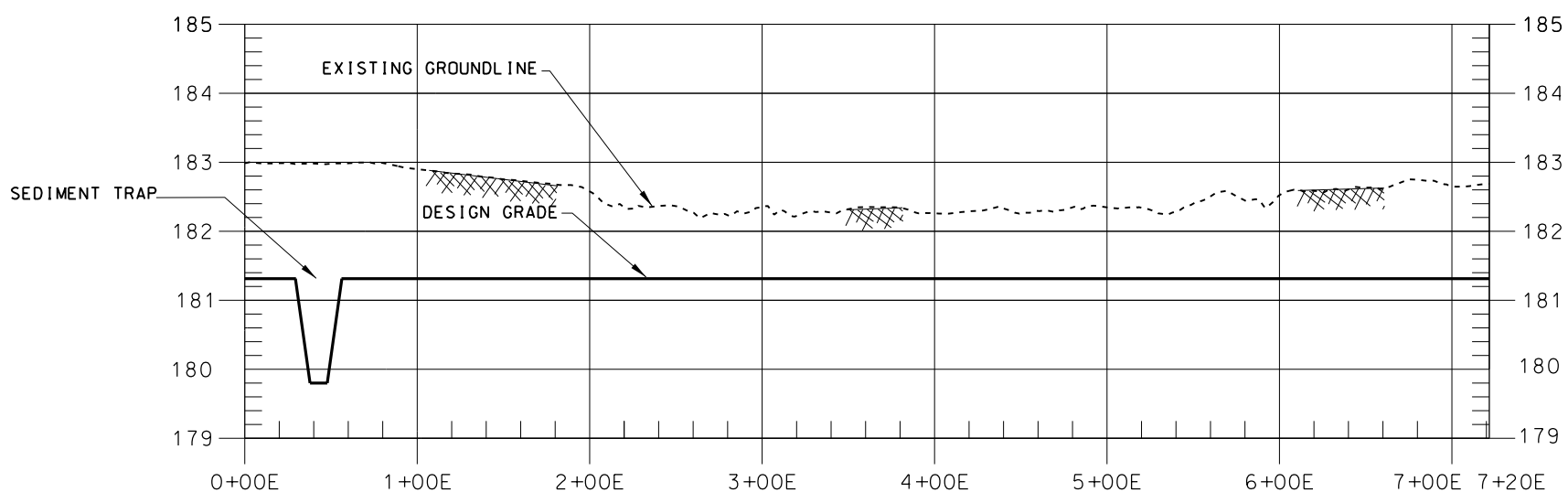
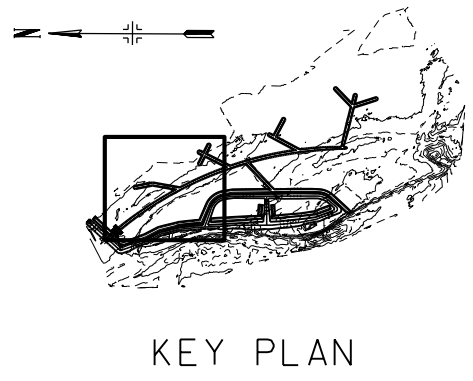
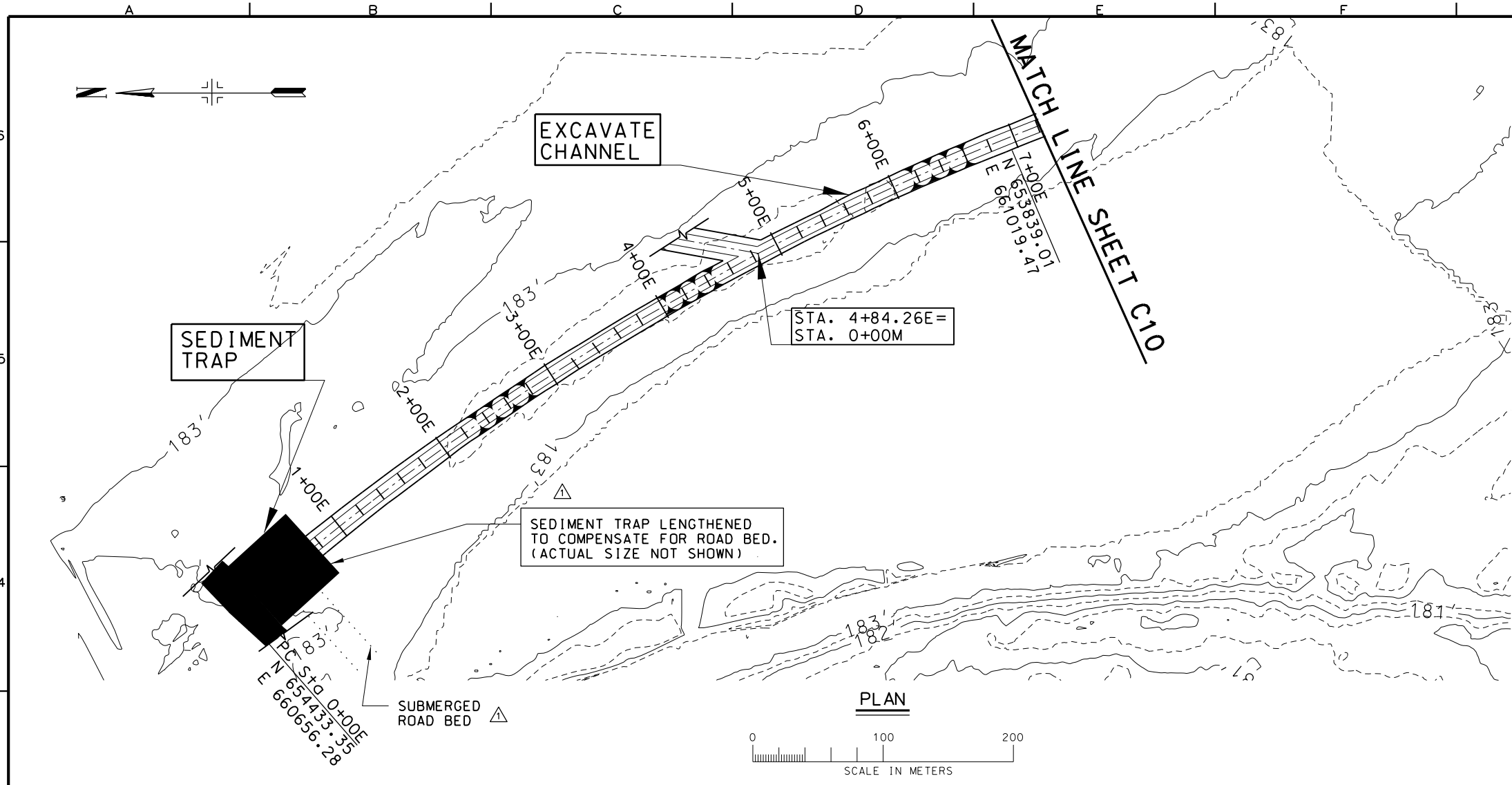
Symbol	Description	Date	Approved
△	AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27 JUL 04 / RJP / ZRH	
		7 JUN 02 / IN / ZDH	

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

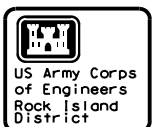
U.S. ARMY ENGINEER DISTRICT  
 CORPS OF ENGINEERS  
 ROCK ISLAND DISTRICT

POOL 11 ISLANDS  
 HABITAT REHABILITATION  
 & ENHANCEMENT PROJECT  
 STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
 PLAN AND PROFILE  
 STA. 0+000 TO 2+200**

Sheet Reference Number:  
**C8**  
 Sheet 12 of 25



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



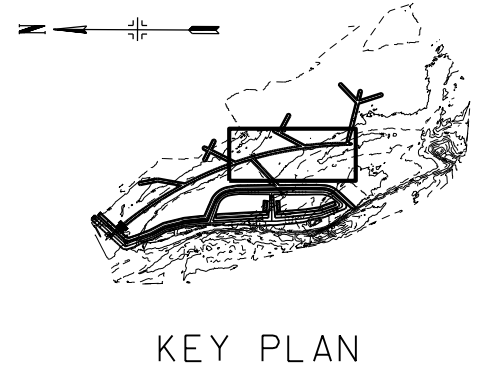
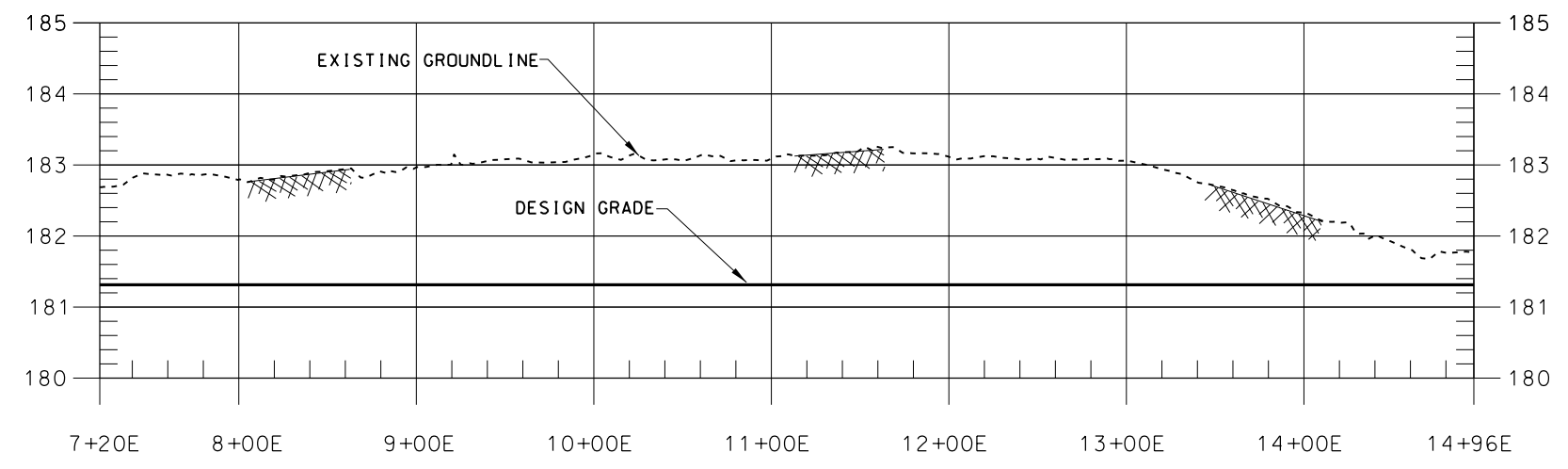
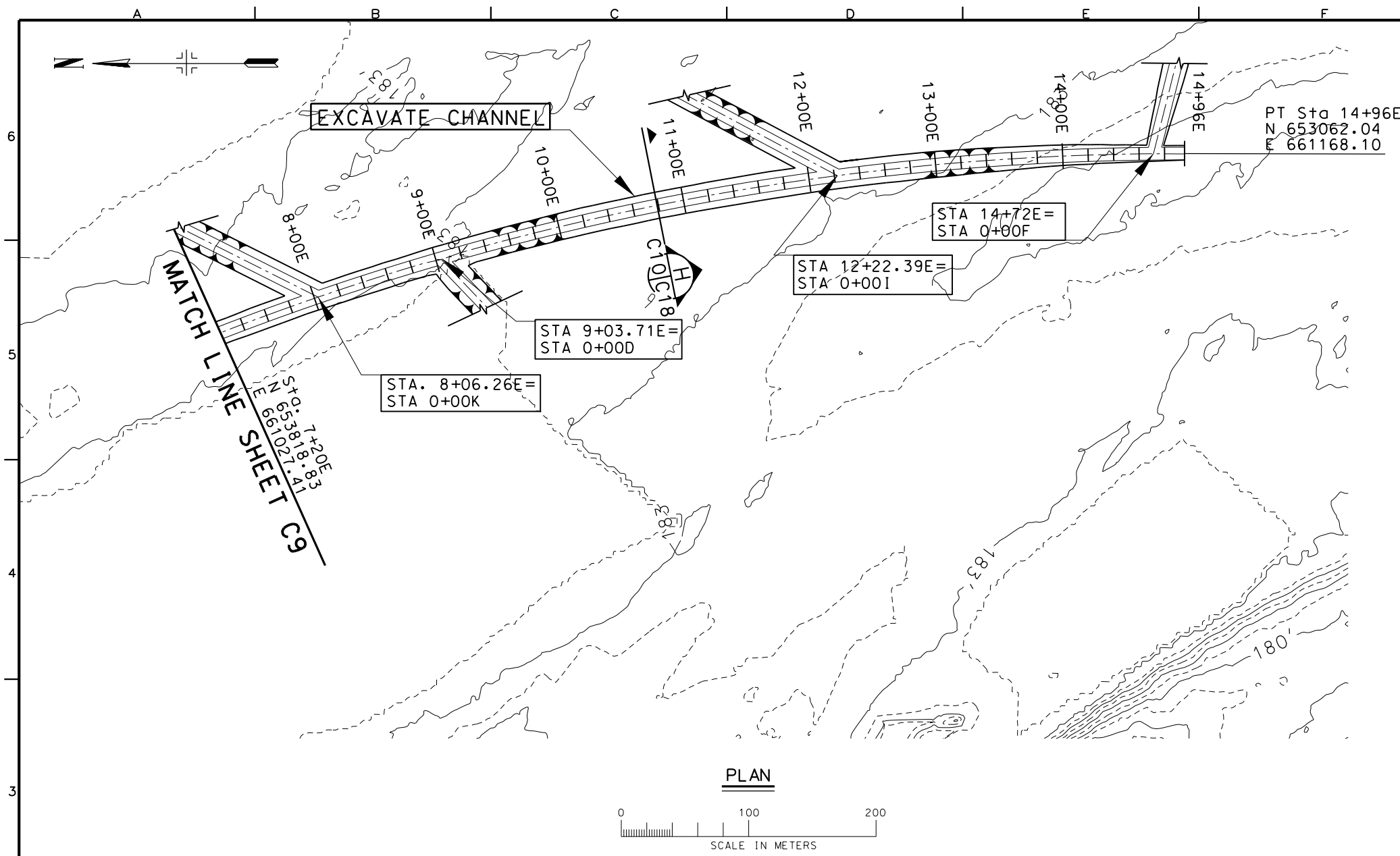
Symbol	Description	Date	Approved
△	REVISAS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27 JUL 04 / RZ/REH	
		7 JUN 02 / RZ/DJH	

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILE  
STA. 0+00E TO 7+20E**

Sheet Reference Number:  
**C9**  
Sheet 13 of 25



PT Sta 14+96E  
N 653062.04  
E 661168.10

STA 14+72E =  
STA 0+00F

STA 12+22.39E =  
STA 0+00I

STA 9+03.71E =  
STA 0+00D

STA. 8+06.26E =  
STA 0+00K

MATCH LINE SHEET C9  
Sta 7+20E  
N 653081.41  
E 661181.81



Symbol	Description	Revisions
△	AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27JUL04/RP/ZRH 7JUN02/IN/DJH Date Approved

Designed By:	RTN	Date:	21 SEP. 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILE  
STA. 7+20E TO 14+96E**

Sheet Reference Number:  
**C10**  
Sheet 14 of 25

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

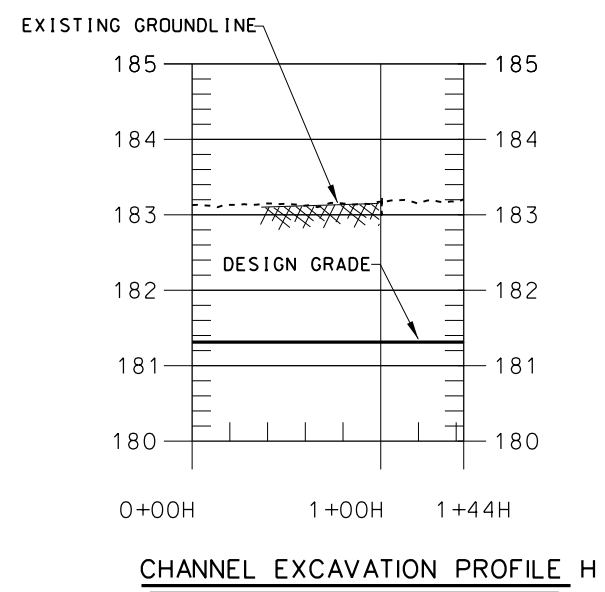
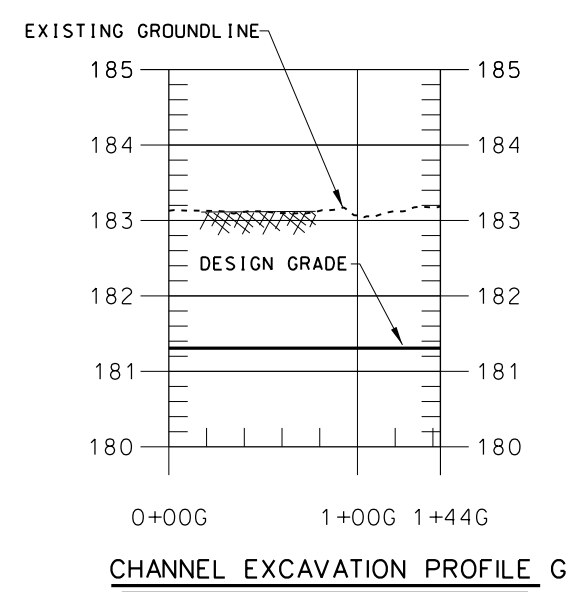
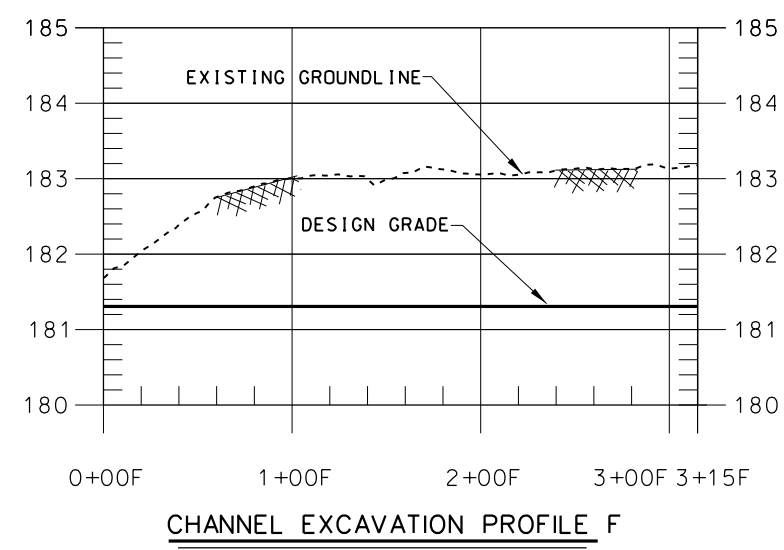
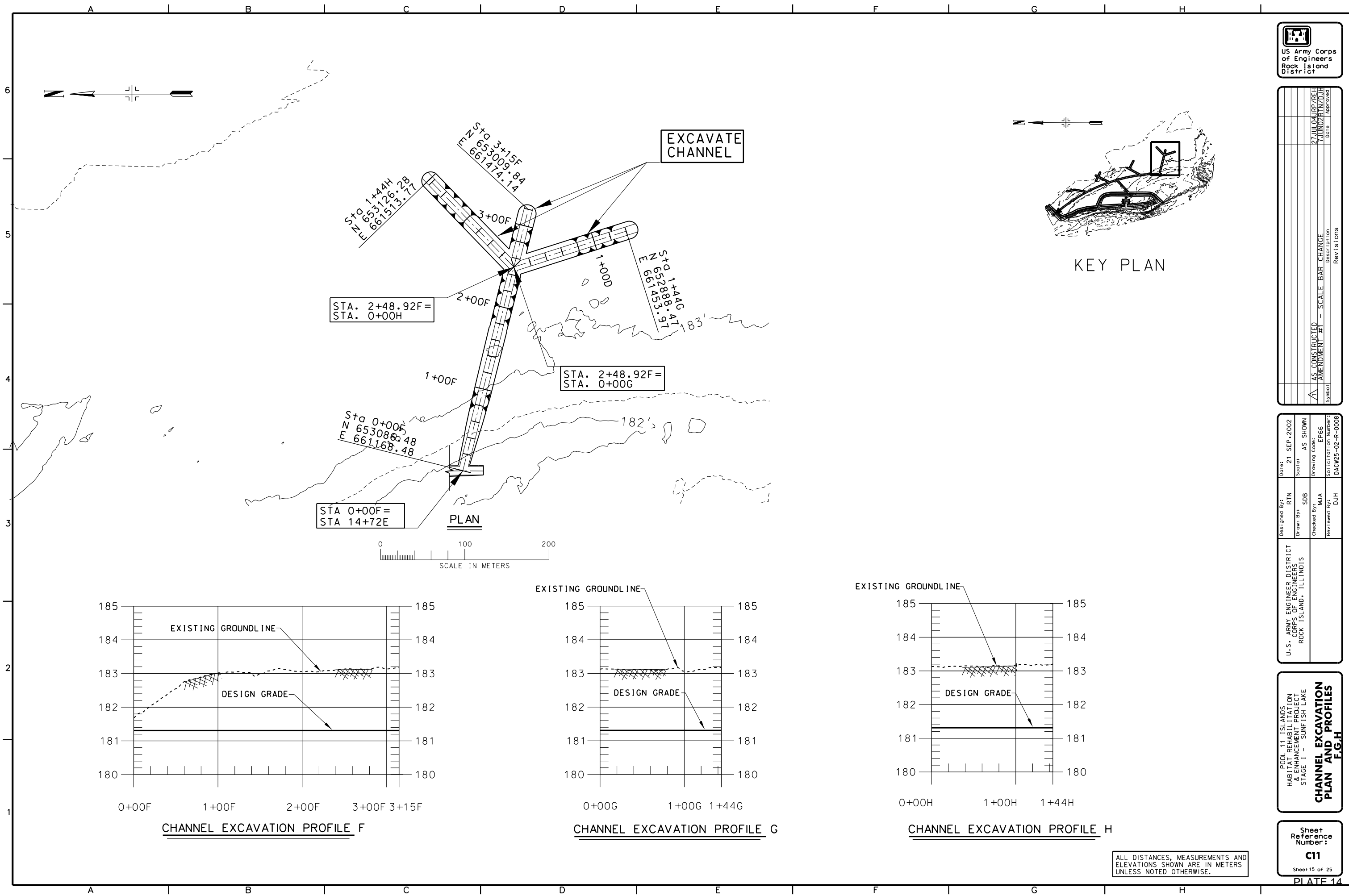
Symbol	Description	Date	Approved
AS	AS CONSTRUCTED	27 JUL 04	JRP/ZRH
AM	AMENDMENT #1 - SCALE BAR CHANGE	7 JUN 02	TN/DJH
	Revisions		

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

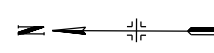
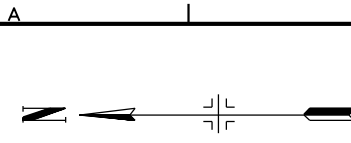
U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILES  
F,G,H**

Sheet Reference Number:  
**C11**  
Sheet 15 of 25  
PLATE 14

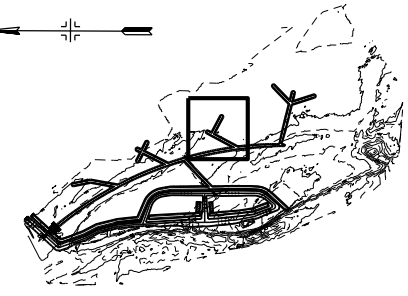


ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

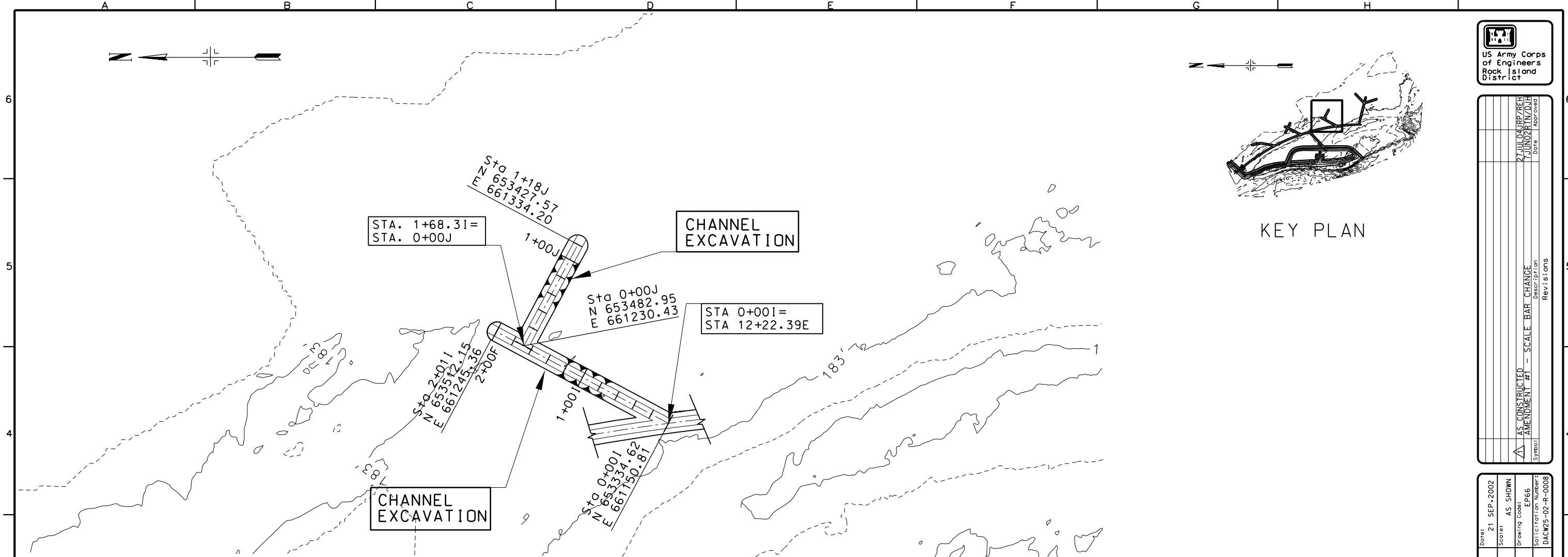


US Army Corps  
of Engineers  
Rock Island  
District

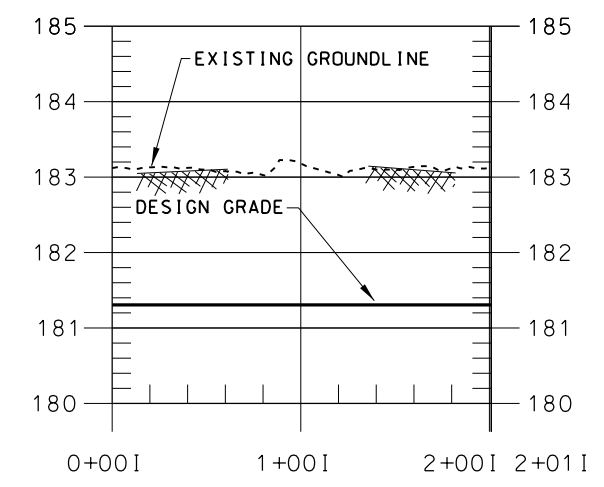
Symbol	Description	Date	Approved
△	AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27 JUL 04 JRP/ZRH 7 JUN 02 RIN/DJH	
	Revisions		



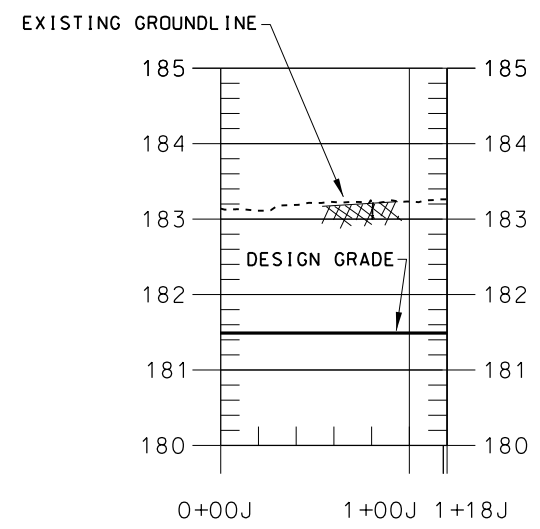
KEY PLAN



PLAN  
SCALE IN METERS



CHANNEL EXCAVATION PROFILE I



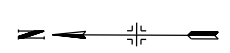
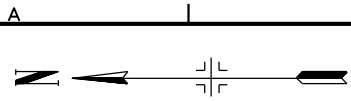
CHANNEL EXCAVATION PROFILE J

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: RTN Drawn By: SDB Checked By: MJA Reviewed By: DJH	Date: 21 SEP 2002 Scale: AS SHOWN Drawing Code: EP66 Specification Number: DACW25-02-R-0008
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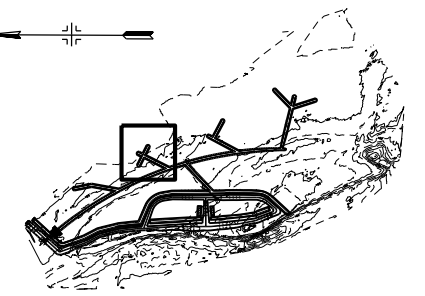
POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILES  
I, J**

Sheet  
Reference  
Number:  
**C12**  
Sheet 16 of 25

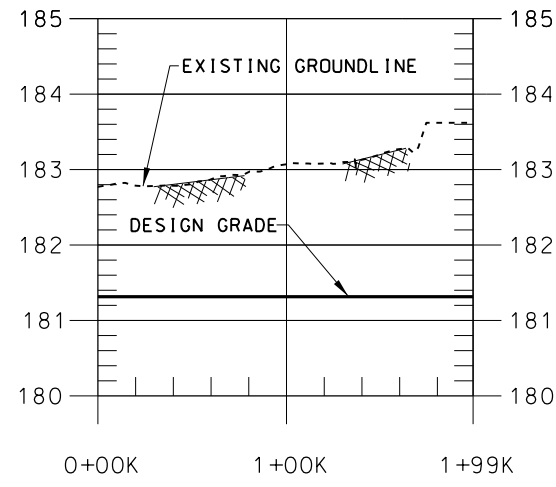
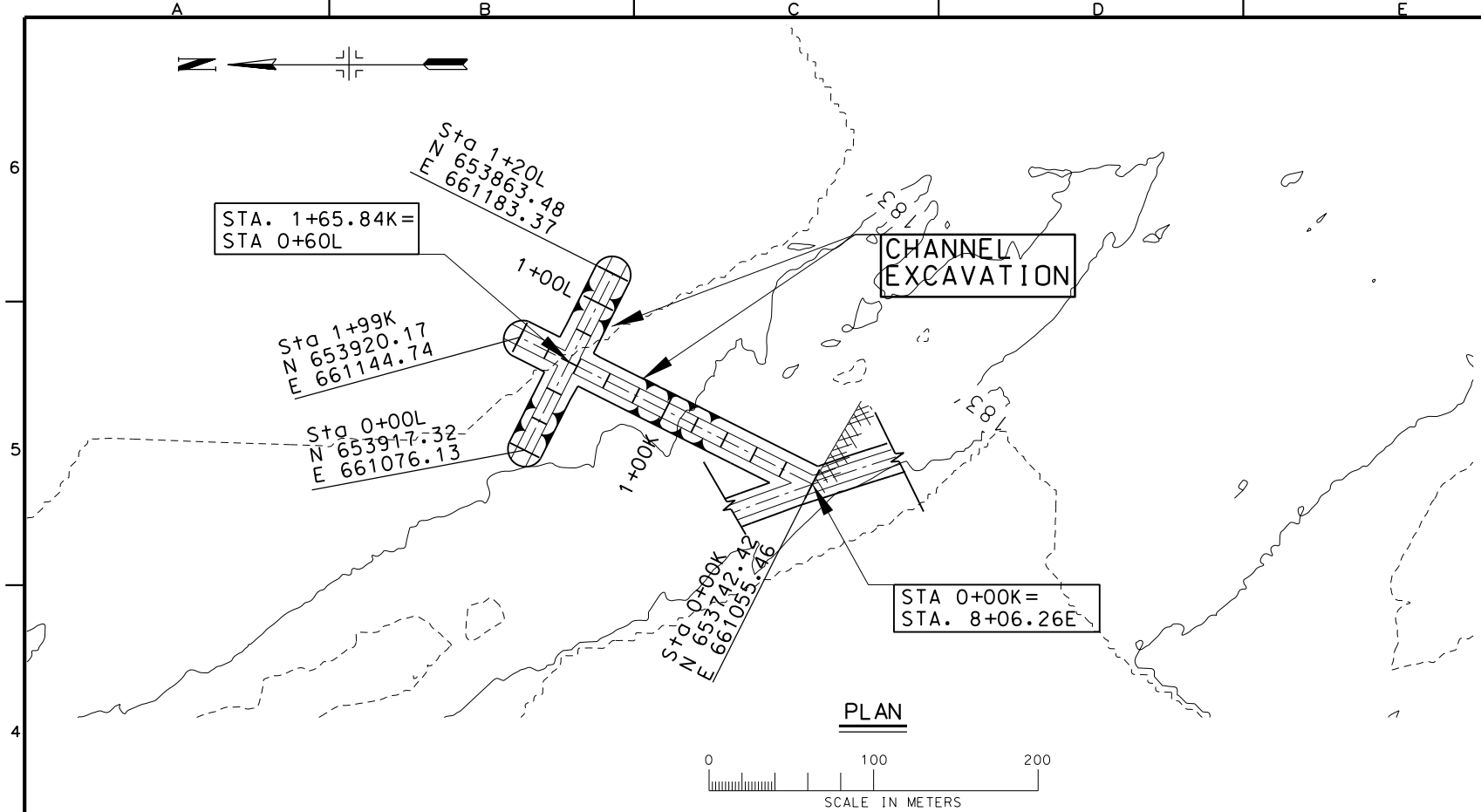


US Army Corps  
of Engineers  
Rock Island  
District

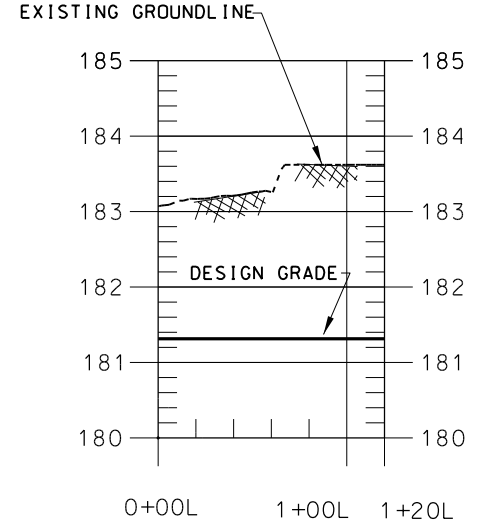
Symbol	AS CONSTRUCTED	AMENDMENT #1 - SCALE BAR CHANGE	Revisions
Date	27 JUL 04	JRP/ZRH	
Date	7 JUN 02	RN/DJH	



KEY PLAN



CHANNEL EXCAVATION PROFILE K



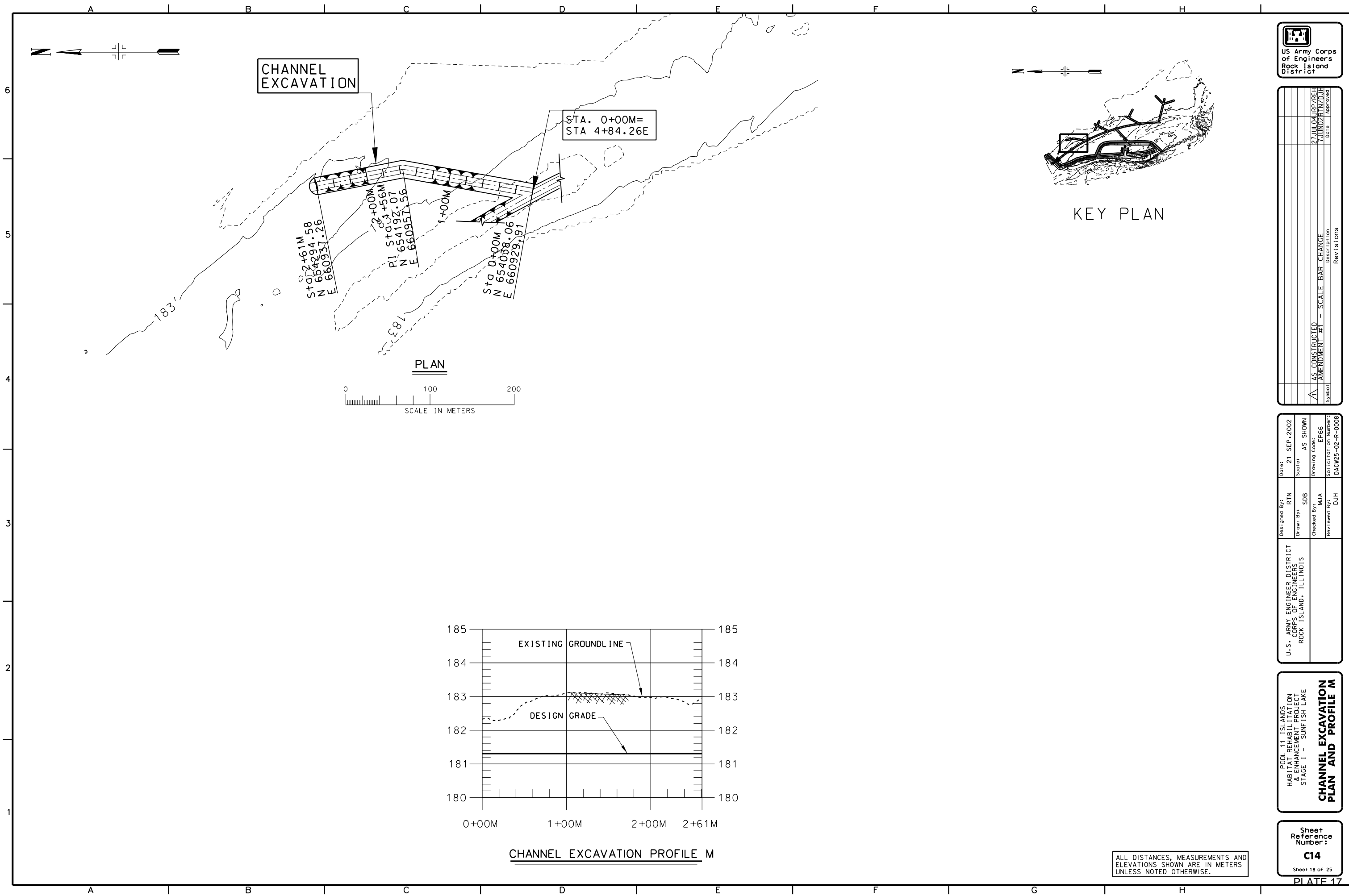
CHANNEL EXCAVATION PROFILE L

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILES  
K/L**

Sheet  
Reference  
Number:  
**C13**  
Sheet 17 of 25

ALL DISTANCES, MEASUREMENTS AND  
ELEVATIONS SHOWN ARE IN METERS  
UNLESS NOTED OTHERWISE.



CHANNEL EXCAVATION

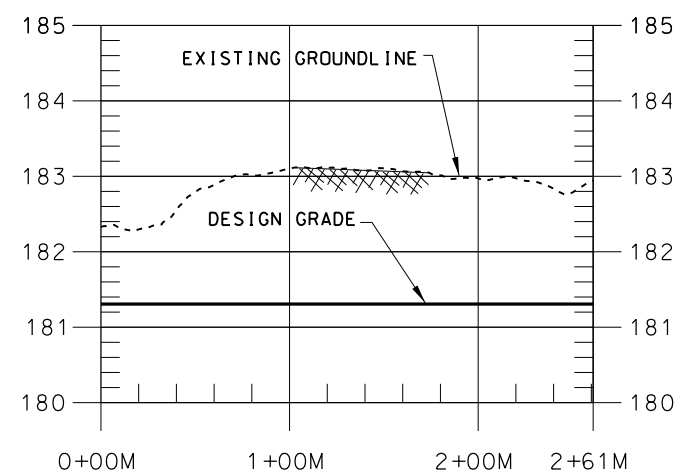
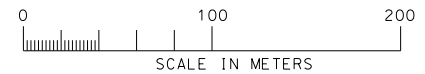
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STO 2+61M  
N 654294.58  
E 660937.26

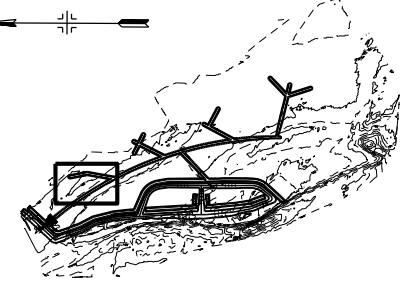
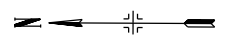
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E 660929.91

PLAN



CHANNEL EXCAVATION PROFILE M



KEY PLAN



Symbol	Description	Date	Approved
△	AS CONSTRUCTED AMENDMENT #1 - SCALE BAR CHANGE	27 JUL 04 JRP/ZRH	
		7 JUN 02 RIN/ZUH	

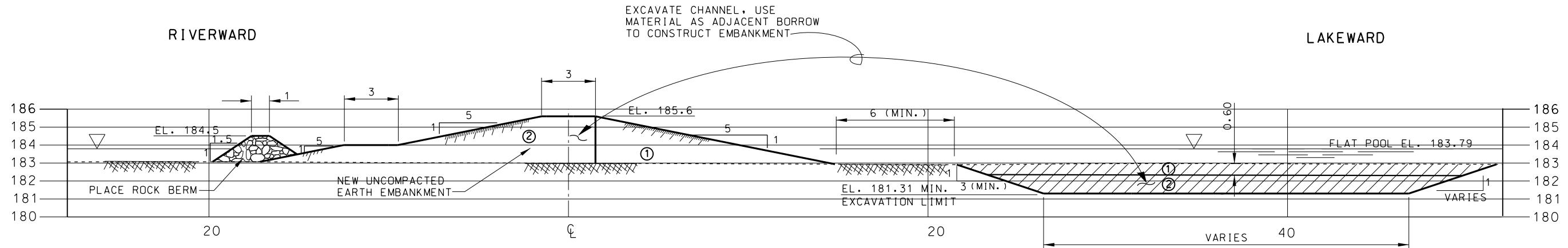
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: RTN Drawn By: SDB Checked By: MJA Reviewed By: DJH	Date: 21 SEP 2002 Scale: AS SHOWN Drawing Code: EP66 Specification Number: DACW25-02-R-0008
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POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILE M**

Sheet Reference Number:  
**C14**  
Sheet 18 of 25

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

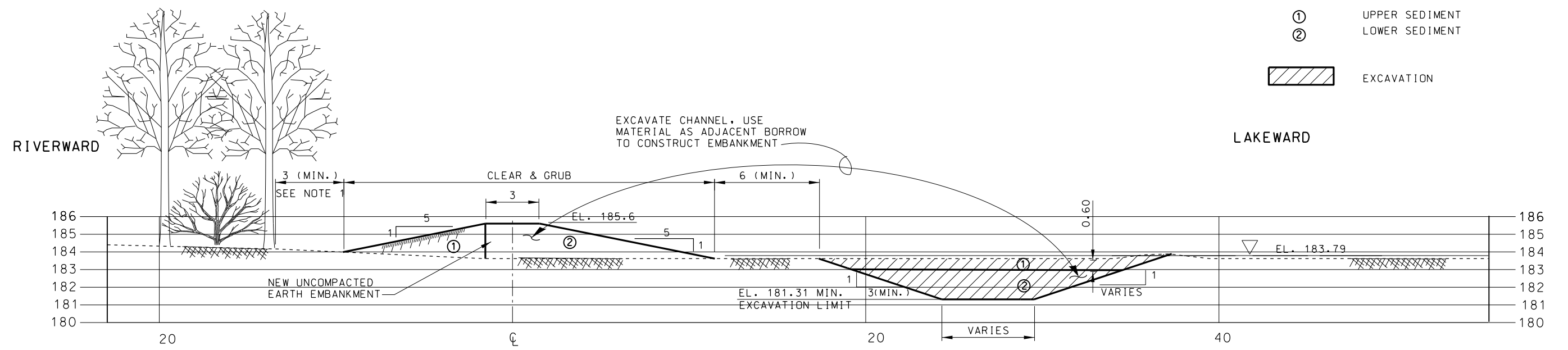
Symbol	Description	Date	Approved
AS CONSTRUCTED		27 JUL 04	JRP/REH



**A**  
C4/C15  
TYPICAL SECTION EMBANKMENT AND EXCAVATION  
NO SCALE  
STA. 0+00A TO 3+50A

**LEGEND**

①	UPPER SEDIMENT
②	LOWER SEDIMENT
	EXCAVATION



**B**  
C4/C15  
TYPICAL SECTION EMBANKMENT EXCAVATION  
NO SCALE  
ADJACENT TO EXISTING ISLAND

- NOTES:**
- EMBANKMENT CENTERLINE MAY BE ADJUSTED AS NECESSARY TO MAINTAIN MINIMUM DISTANCE FROM TREE LINE. NO DAMAGE MAY BE CAUSED TO ANY TREE LARGER THAN 10 CENTIMETER DIAMETER.

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

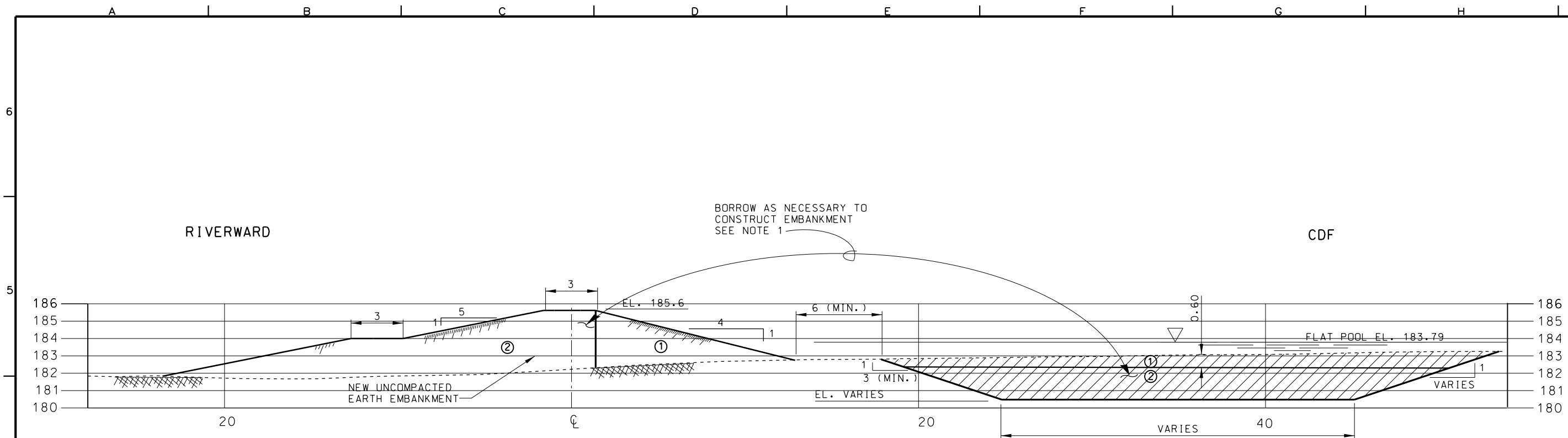
Designed By:	RTN	Date:	21 SEP. 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**TYPICAL SECTIONS I**

Sheet Reference Number:  
**C15**  
Sheet 19 of 25

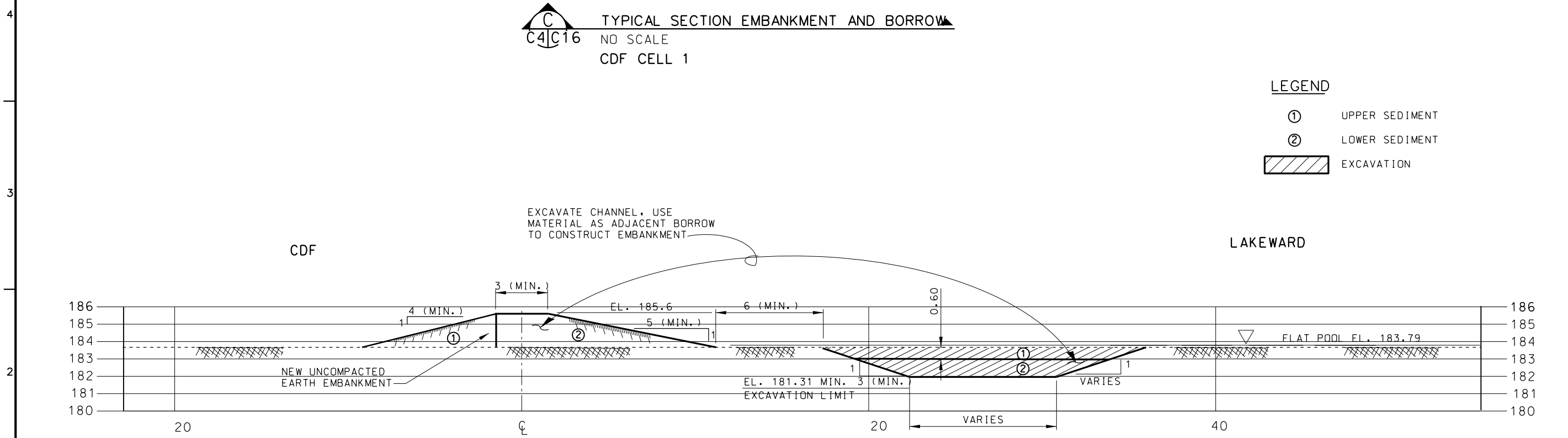


Symbol	Description	Date	Approved
AS CONSTRUCTED		27 JUL 04	JRP/REH



**C4/C16** TYPICAL SECTION EMBANKMENT AND BORROW  
NO SCALE  
CDF CELL 1

- LEGEND**
- ① UPPER SEDIMENT
  - ② LOWER SEDIMENT
  - [Hatched Box] EXCAVATION



**C6/C16** TYPICAL SECTION EMBANKMENT AND EXCAVATION  
NO SCALE  
CDF CELL 1

Designed By:	RTN	Date:	21 SEP. 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE

**TYPICAL SECTIONS II**

Sheet  
Reference  
Number:  
**C16**  
Sheet 20 of 25

ALL DISTANCES, MEASUREMENTS AND  
ELEVATIONS SHOWN ARE IN METERS  
UNLESS NOTED OTHERWISE.

Symbol	Description	Date	Approved
AS CONSTRUCTED		27 JUL 04	JRP/REH

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

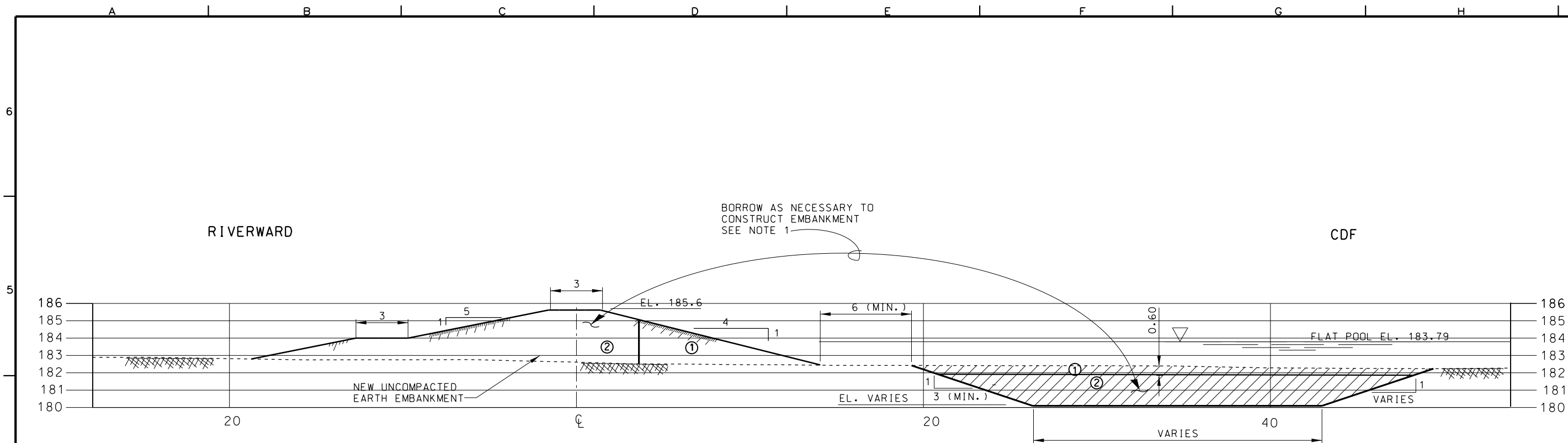
U.S. ARMY ENGINEER DISTRICT  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE

**TYPICAL SECTIONS III**

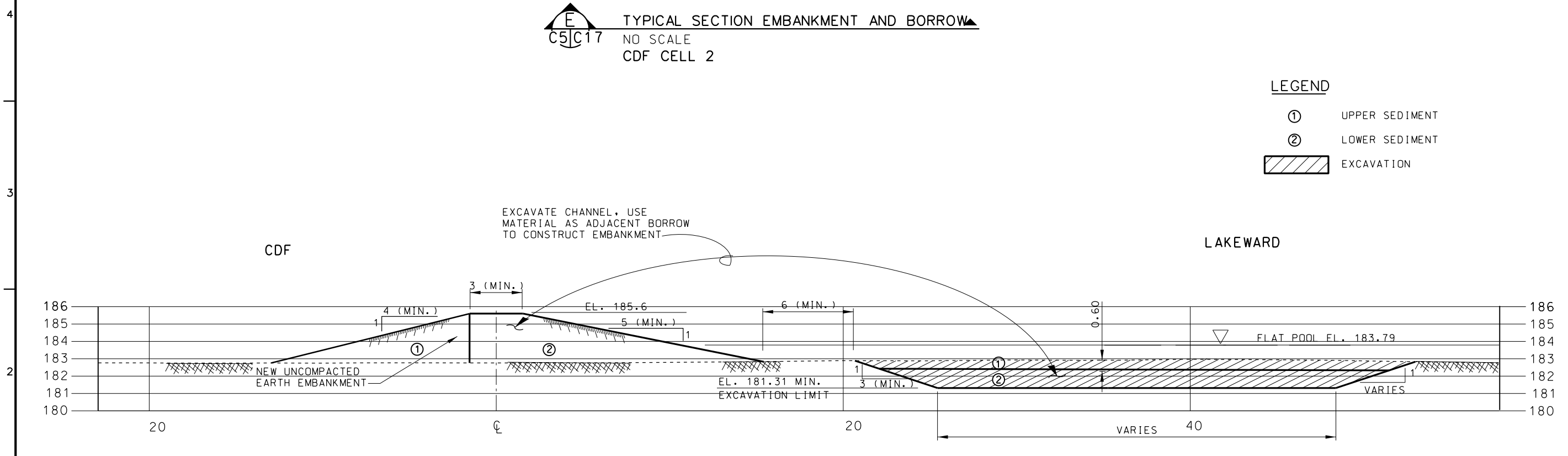
Sheet Reference Number:  
**C17**  
Sheet 21 of 25

22:48:00 21 SEP 2002 11:13:00  
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22:48:00 21 SEP 2002 11:13:00



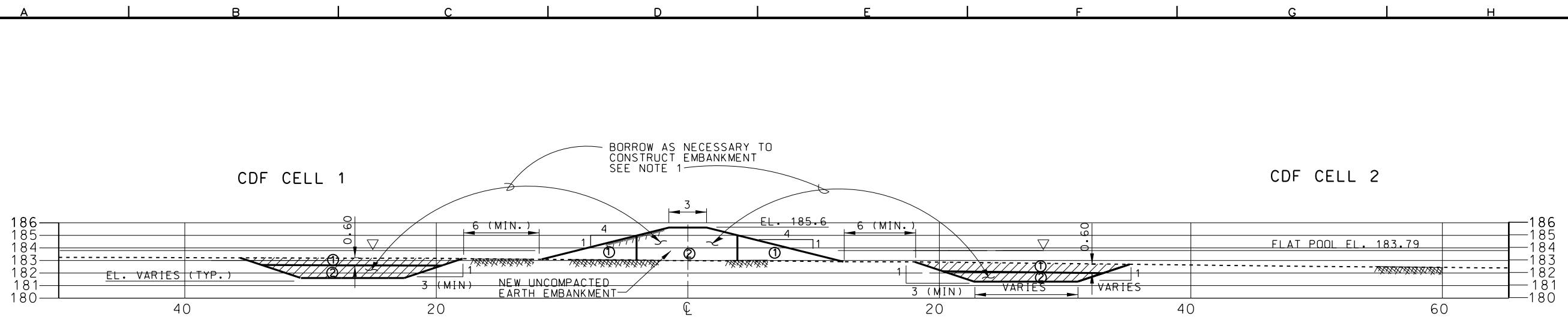
**E**  
C5|C17  
TYPICAL SECTION EMBANKMENT AND BORROW  
NO SCALE  
CDF CELL 2

- LEGEND**
- ① UPPER SEDIMENT
  - ② LOWER SEDIMENT
  - [Hatched Box] EXCAVATION



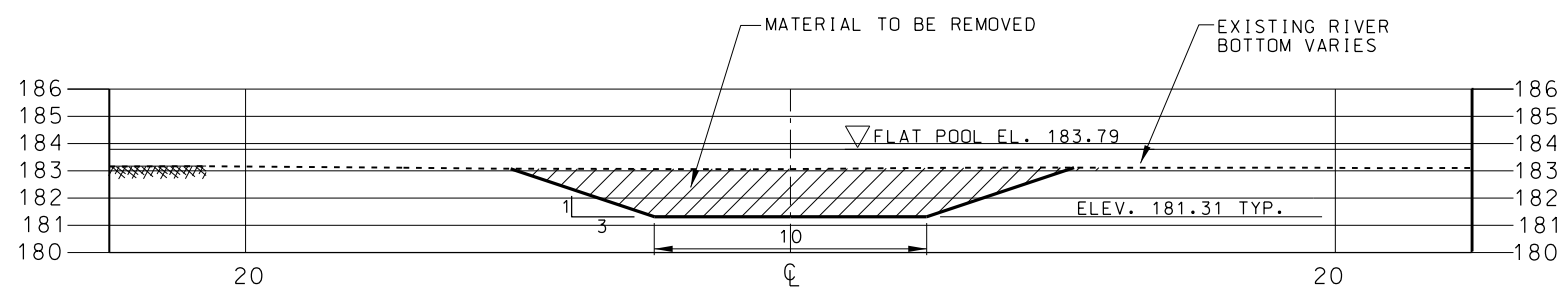
**F**  
C6|C17  
TYPICAL SECTION EMBANKMENT AND EXCAVATION  
NO SCALE  
CDF CELL 2

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



**G**  
C7|C18  
TYPICAL SECTION EMBANKMENT AND BORROW  
NO SCALE  
BETWEEN CDF CELLS

- LEGEND**
- ① UPPER SEDIMENT
  - ② LOWER SEDIMENT
  - ▨ EXCAVATION



**H**  
C9|C18  
CHANNEL EXCAVATION TYPICAL SECTION  
NO SCALE

NOTE:  
SECTION H WAS MODIFIED PER VALUE ENGINEERING PROPOSAL,  
CONTRACT MODIFICATION #A0005 DATED AUGUST 8, 2003.

Symbol	Description	Date	Approved
▨	REVISAS AS CONSTRUCTED	27 JUL 04 JRP/REH	
	MOD. - EXCAVATION CHANNEL CHANGE		

Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MJA	Drawing Code:	EP66
Reviewed By:	DJH	Specification Number:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**TYPICAL SECTIONS IV**

Sheet  
Reference  
Number:  
**C18**  
Sheet 22 of 25

ALL DISTANCES, MEASUREMENTS AND  
ELEVATIONS SHOWN ARE IN METERS  
UNLESS NOTED OTHERWISE.



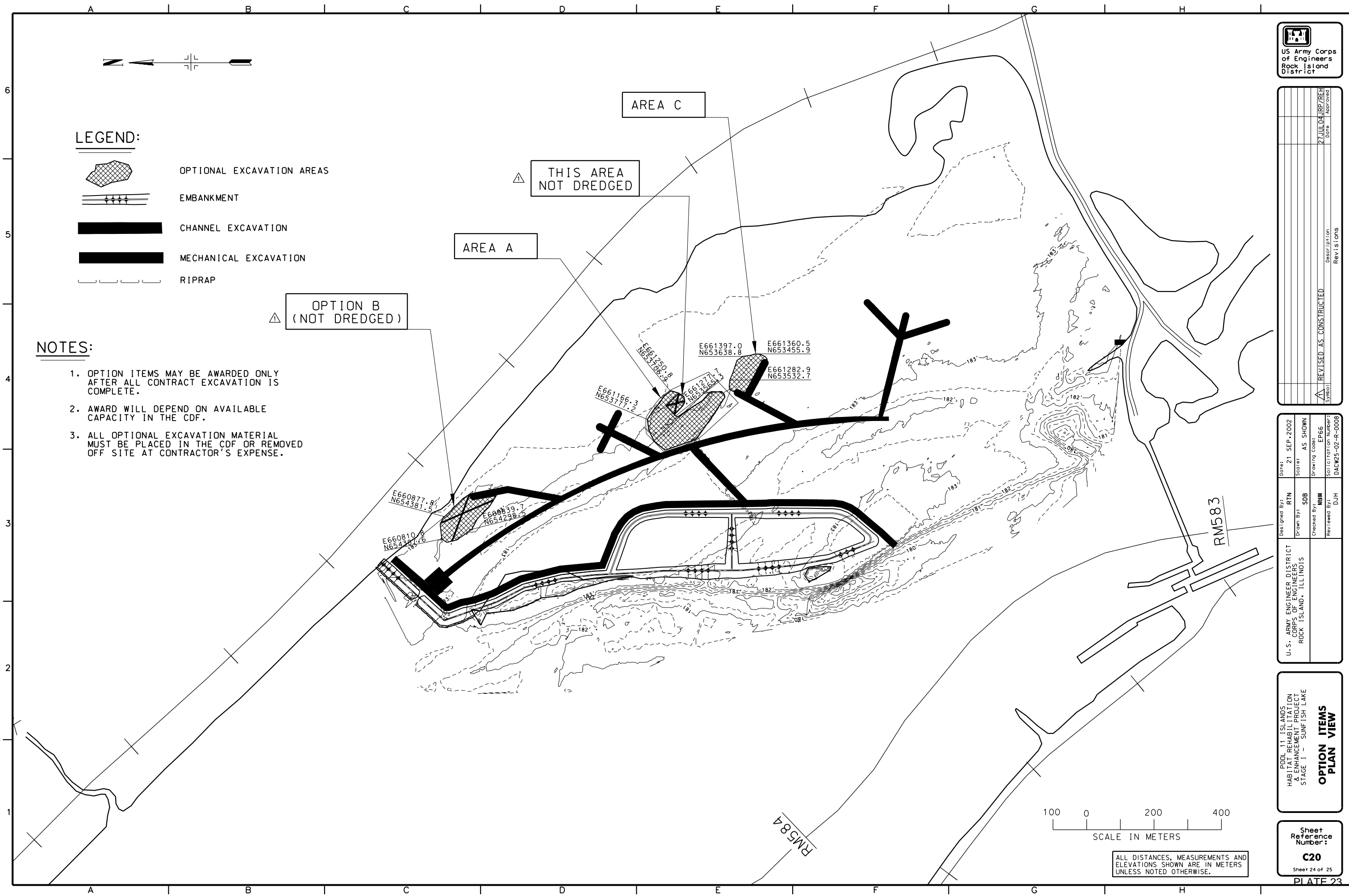
Symbol	Description	Revisions
△	REVISED AS CONSTRUCTED	
		27 JUL 04 JRP/REH Date Approved

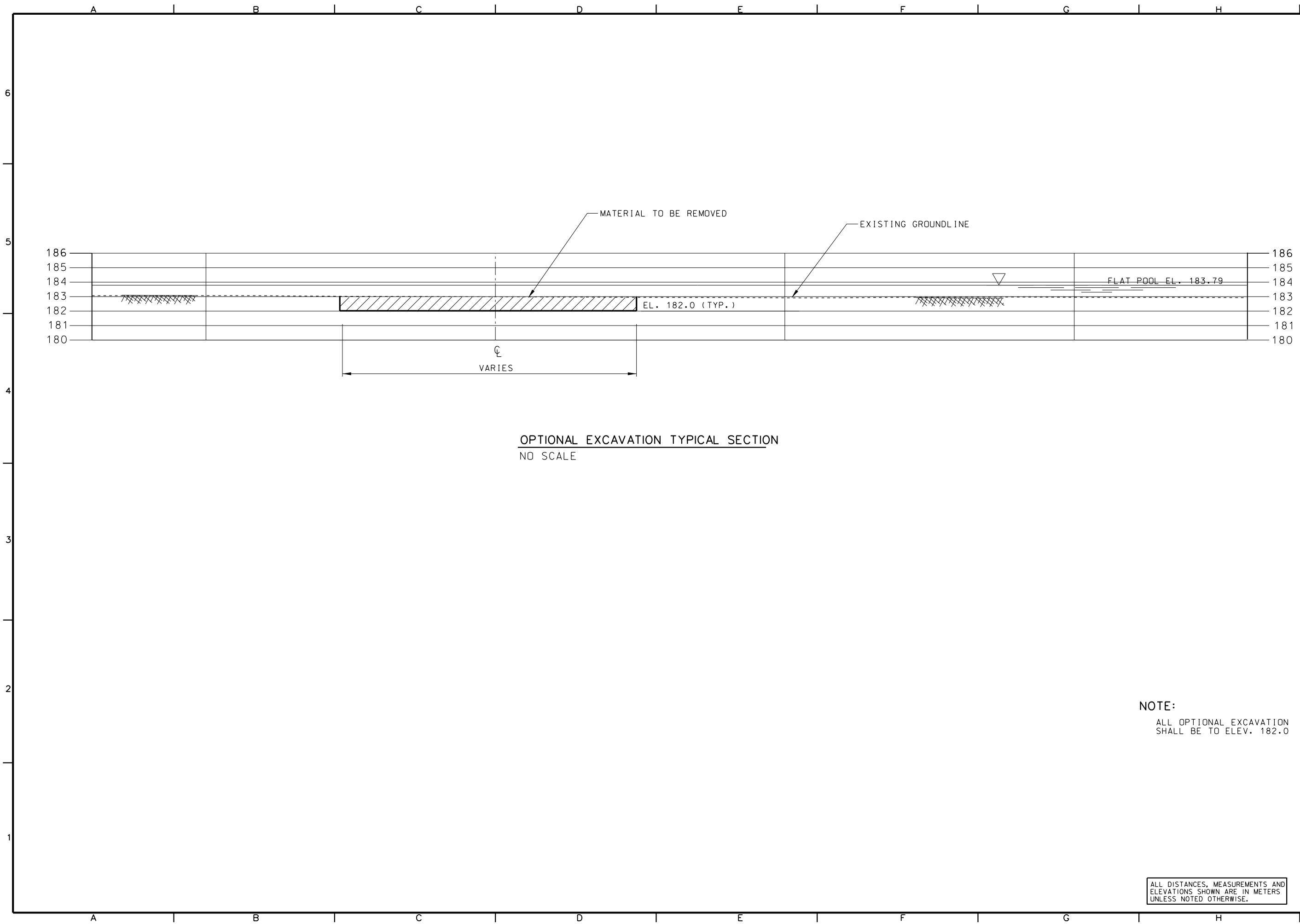
Designed By:	RTN	Date:	21 SEP 2002
Drawn By:	SDB	Scale:	AS SHOWN
Checked By:	MNM	Drawing Code:	EPE6
Reviewed By:	DJH	Soil Condition Number:	DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**OPTION ITEMS  
PLAN VIEW**

Sheet Reference Number:  
**C20**  
Sheet 24 of 25  
PLATE 23

Z:\PROJECTS\ep6\asbu\11S\ep6c20A.dgn





**OPTIONAL EXCAVATION TYPICAL SECTION**  
NO SCALE

**NOTE:**  
ALL OPTIONAL EXCAVATION  
SHALL BE TO ELEV. 182.0

ALL DISTANCES, MEASUREMENTS AND  
ELEVATIONS SHOWN ARE IN METERS  
UNLESS NOTED OTHERWISE.

Symbol	Description	Date	Approved
AS CONSTRUCTED		27 JUL 04	JRP/REH

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: RTN	Date: 21 SEP 2002
	Drawn By: SDB	Scale: AS SHOWN
	Checked By: MJA	Drawing Code: EP66
	Reviewed By: DJH	Specification Number: DACW25-02-R-0008

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 1 - SUNFISH LAKE  
**OPTION ITEMS  
TYPICAL SECTION**

Sheet  
Reference  
Number:  
**C21**  
Sheet 19 of 25



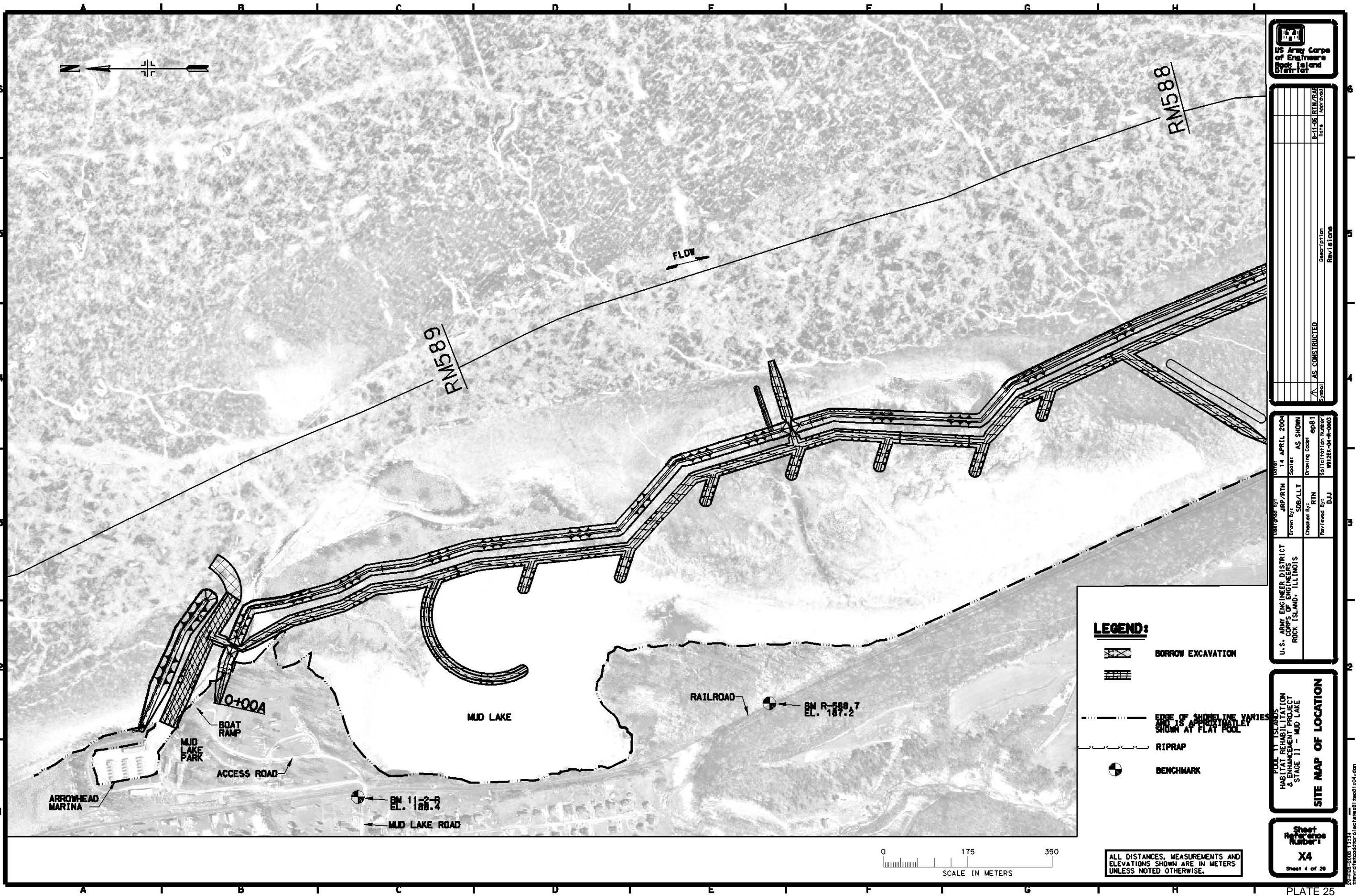
US Army Corps of Engineers  
Rock Island District

Symbol	Description	Date	Revised
AS CONSTRUCTED		8-11-06	RTN/LLT

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	DATE: 14 APRIL 2004	SCALE: AS SHOWN	DRAWING CODE: ep81
	DESIGNED BY: JRP/RTN	DRAWN BY: SOB/LLT	CHECKED BY: RTN
	REVIEWED BY: DJJ	DATE: 8-11-06	REVISION: 01

POOL 11 ISLAND'S  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 11 - MUD LAKE  
**SITE MAP OF LOCATION**

Sheet Reference Number  
**X4**  
Sheet 4 of 20



- LEGEND:**
- BORROW EXCAVATION
  - RIPRAP
  - EDGE OF SHOULDER VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
  - BENCHMARK

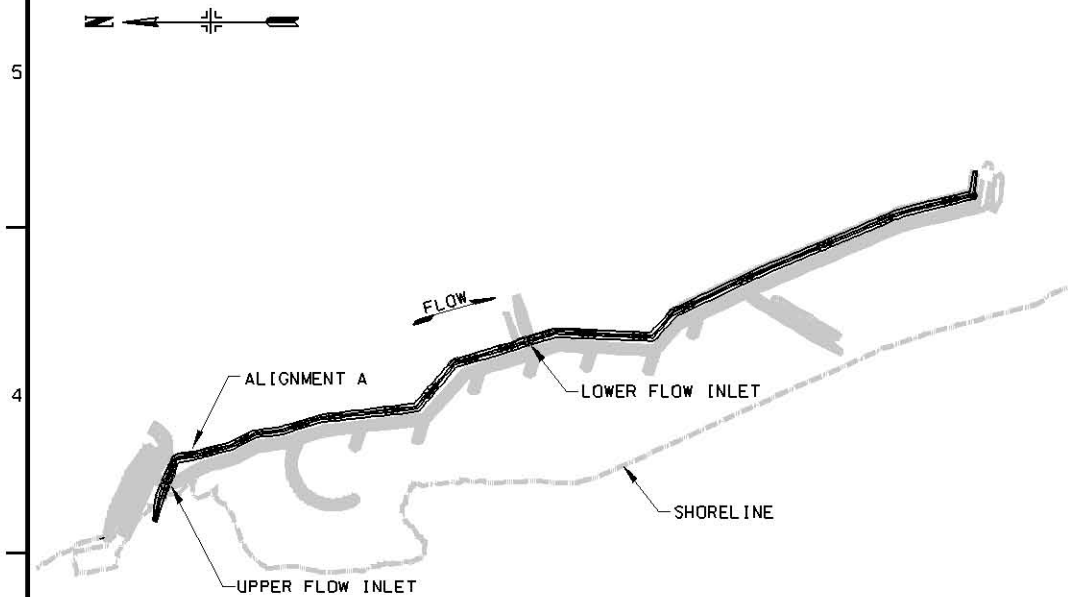
ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

**CONSTRUCTION FEATURES**

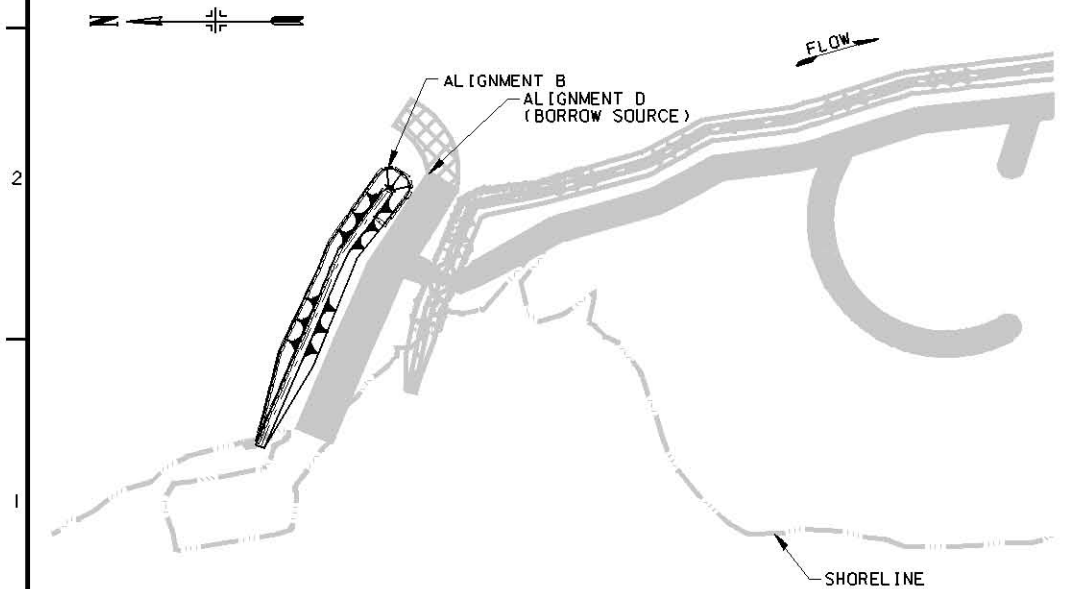
THE FOLLOWING PROVIDES A BRIEF DESCRIPTION OF THE MAJOR PROJECT FEATURES. IT IS NOT NECESSARILY A CONSTRUCTION SEQUENCE.



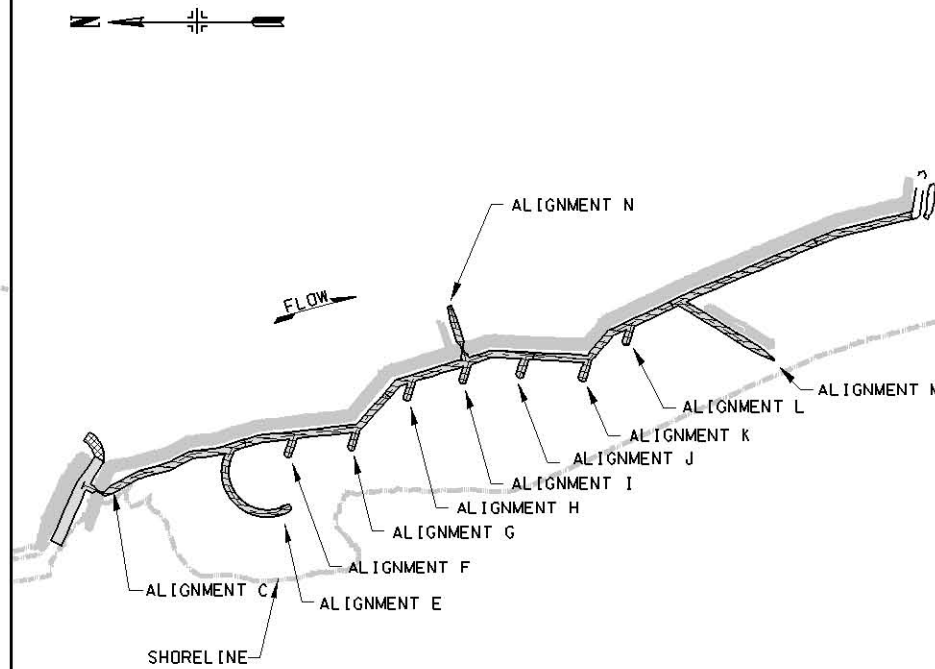
**FEATURE: DEFLECTION EMBANKMENT A**  
 CONSTRUCT DEFLECTION EMBANKMENT USING ADJACENT BORROW FROM RIVER BED.



**FEATURE: DEFLECTION EMBANKMENT B**

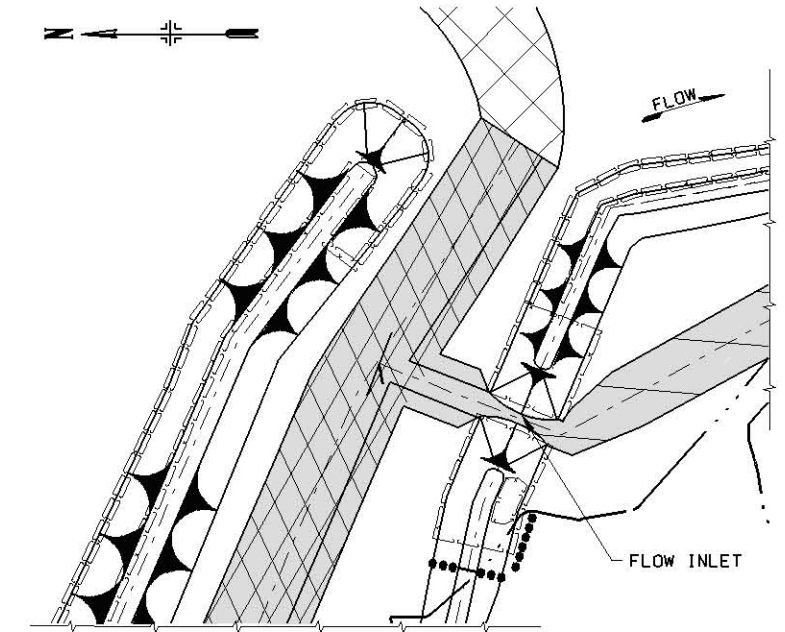


**FEATURE: DEEP WATER FISH HABITAT**  
 (ALIGNMENTS C, E-M) CONSTRUCT A SYSTEM OF DEEP-WATER CHANNELS FOR FISH HABITAT.

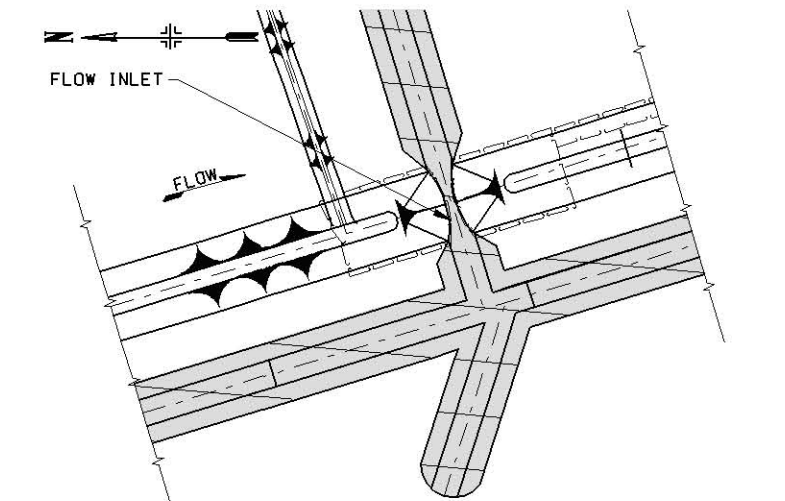


THE EXCAVATED CHANNELS WILL PROVIDE APPROXIMATELY 8.8 HECTARES OF FISH HABITAT, AS WELL AS A MATERIAL SOURCE FOR CONSTRUCTION OF EMBANKMENT (ALIGNMENT A).

**FEATURE: UPPER FLOW INLET**  
 CONSTRUCT A FLOW INLET IN THE DEFLECTION EMBANKMENT TO ALLOW NOMINAL FLOW THROUGH THE NEWLY EXCAVATED CHANNELS. PLACE RIPRAP TO PROTECT THE INLET FROM EROSION. FLOW INLET DETAILS MAY BE FOUND ON SHEET C13.



**FEATURE: LOWER FLOW INLET**  
 CONSTRUCT A FLOW INLET IN THE DEFLECTION EMBANKMENT TO ALLOW NOMINAL FLOW THROUGH THE NEWLY EXCAVATED CHANNELS. PLACE RIPRAP TO PROTECT THE INLET FROM EROSION. FLOW INLET DETAILS MAY BE FOUND ON SHEET C13.



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

Symbol	AS CONSTRUCTED	Description	Revisions
Date	8-11-06	RTN/RAP	Approved

Designed By:	JRP/RTN	Date:	14 APRIL 2004
Drawn By:	SDG/LLT	Scale:	AS SHOWN
Checked By:	RTN	Drawing Code:	ep81
Reviewed By:	DJJ	Specification Number:	W12EK-04-R-0003

U.S. ARMY ENGINEER DISTRICT  
 CORPS OF ENGINEERS  
 ROCK ISLAND DISTRICT

POOL 11 ISLANDS  
 HABITAT REHABILITATION  
 & ENHANCEMENT PROJECT  
 STAGE II - MUD LAKE  
**CONSTRUCTION FEATURES**

Sheet Reference Number:  
**X5**  
 Sheet 5 of 20



8-11-06	RTN/RAP	Approved
24SEP04	RTN/RUR	Designation
REVISED AS CONSTRUCTED		
MOD. # 1 - STATION DISTANCE CHANGE		
5/16/08	Designation	Rev 16 1018

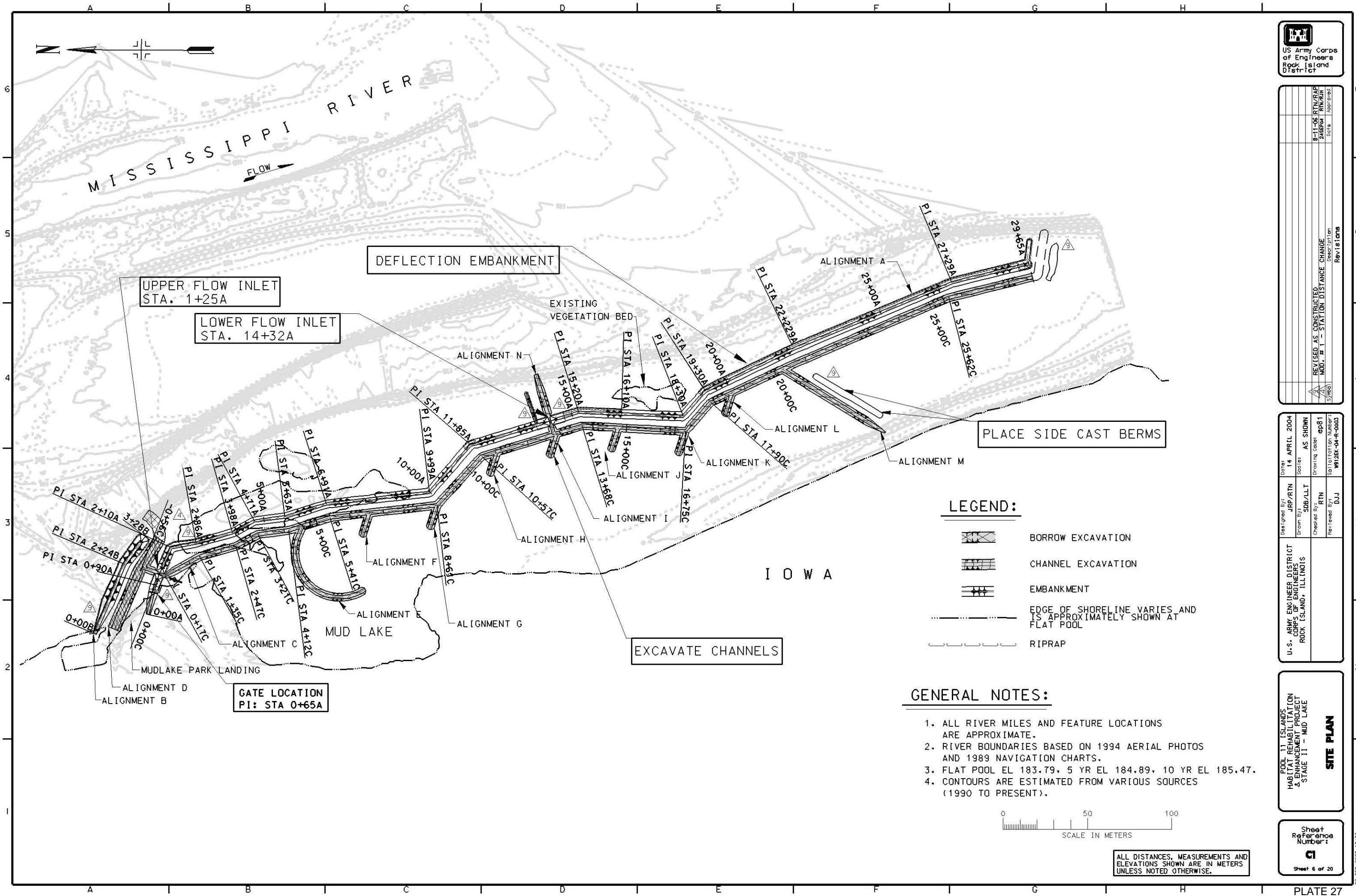
Date:	14 APRIL 2004
Designed By:	JRP/RTN
Drawn By:	SDB/LLT
Checked By:	RTN
Reviewed By:	DJJ
Scale:	AS SHOWN
Drawing Code:	ep81
Revision Number:	W12EK-04-R-0003

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE

**SITE PLAN**

Sheet Reference Number:  
**CI**  
Sheet 6 of 20

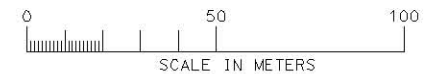


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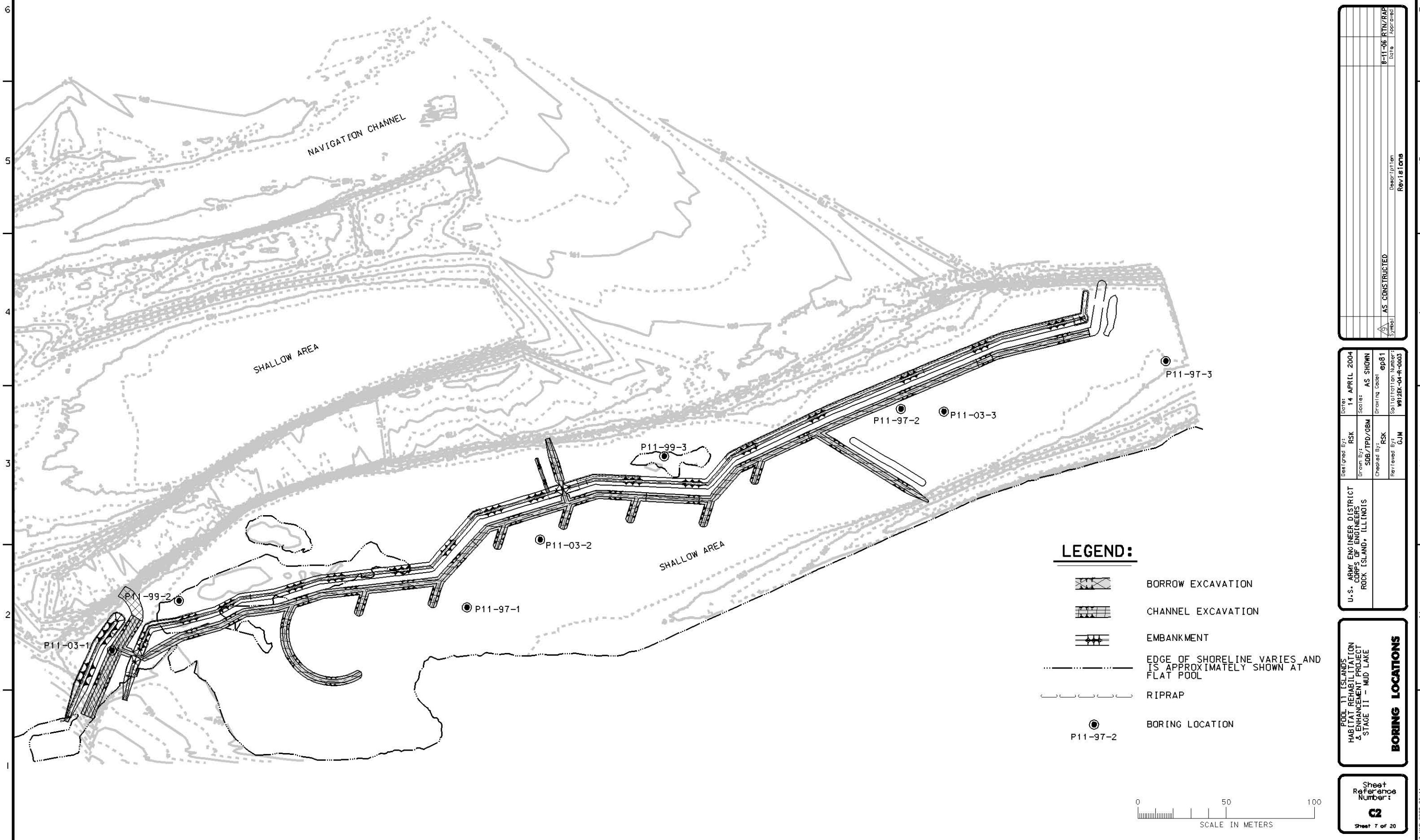
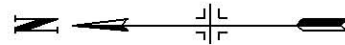
- BORROW EXCAVATION
- CHANNEL EXCAVATION
- EMBANKMENT
- EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
- RIPRAP

**GENERAL NOTES:**

1. ALL RIVER MILES AND FEATURE LOCATIONS ARE APPROXIMATE.
2. RIVER BOUNDARIES BASED ON 1994 AERIAL PHOTOS AND 1989 NAVIGATION CHARTS.
3. FLAT POOL EL 183.79, 5 YR EL 184.89, 10 YR EL 185.47.
4. CONTOURS ARE ESTIMATED FROM VARIOUS SOURCES (1990 TO PRESENT).

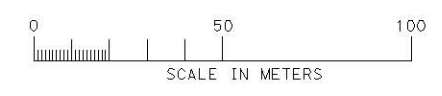


ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



**LEGEND:**

- BORROW EXCAVATION
- CHANNEL EXCAVATION
- EMBANKMENT
- EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
- RIPRAP
- BORING LOCATION  
P11-97-2



Symbol	Description	Revision
AS CONSTRUCTED		
8-11-06	RTN/RAP	Approved

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND DISTRICT	Designed By: RSK	Date: 14 APRIL 2004
	Drawn By: SDB/TPD/OBM	Scale: AS SHOWN
	Checked By: RSK	Drawing Code: ep81
	Reviewed By: GJM	Specification Number: W12EK-04-R-0003

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE

**BORING LOCATIONS**

Sheet Reference Number:  
**02**  
Sheet 7 of 20



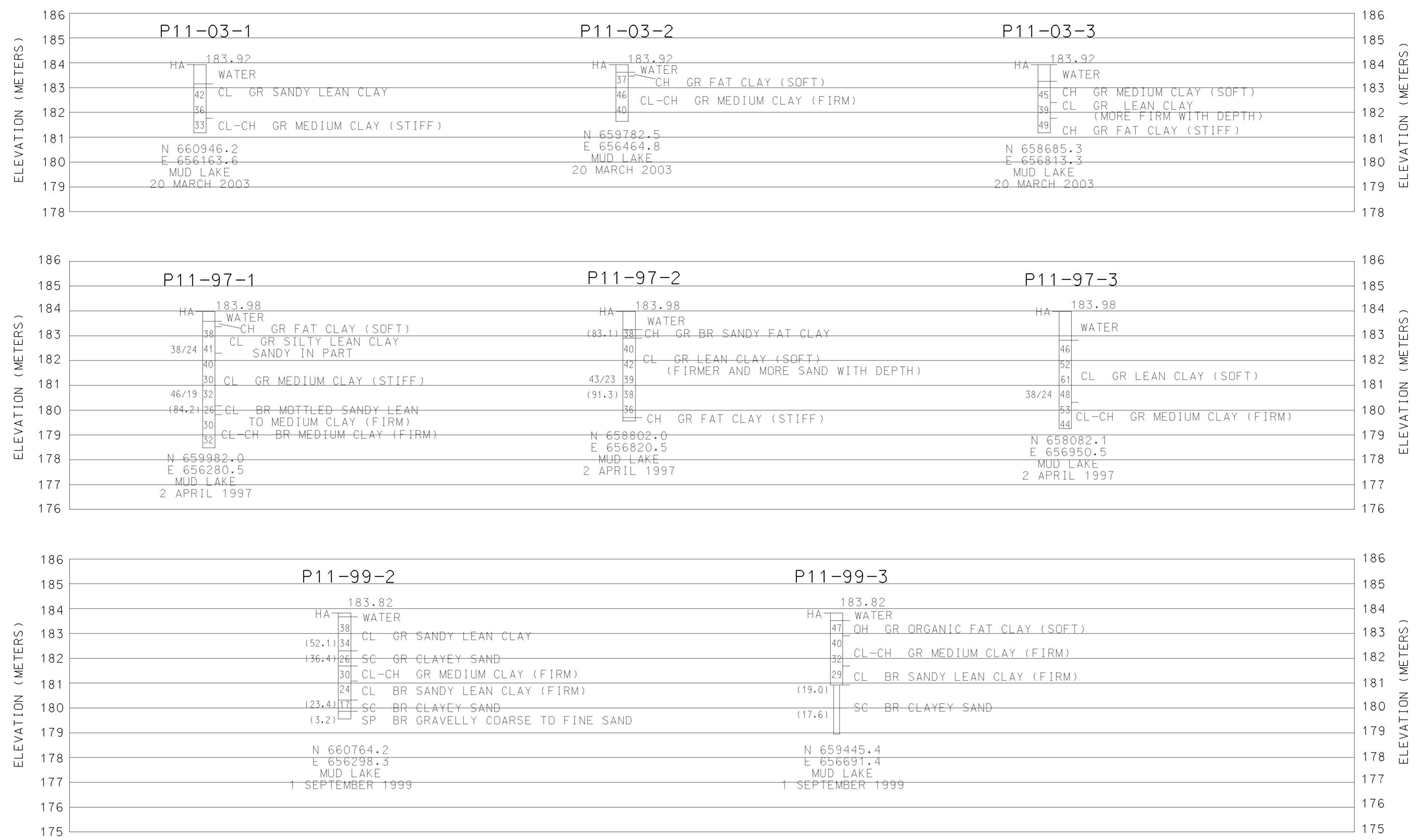
Symbol	Description	Date	Approved
AS CONSTRUCTED		8-11-06	

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: RSK	Date: 14 APRIL 2004
	Drawn By: CJK/TFD/GBM	Scale: AS SHOWN
	Checked By: RSK	Drawing Code: ep81
	Reviewed By: GJM	Specification Number: WS12EK-04-R-0003

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE

**BORING LOGS**

Sheet Reference Number:  
**3**  
Sheet 8 of 20



**LEGEND**

BORING NUMBER

HOLE ADVANCED BY HAND AUGER HA TOP ELEVATION (IN METERS) NGVD 12

WATER LEVEL WL

PERCENT PASSING #200 SIEVE (6.7)

LIQUID AND PLASTIC LIMIT 46/28

D<sub>10</sub> SIZE (mm) 0.19

21 NATURAL MOISTURE CONTENT IN PERCENT DRY WEIGHT

MAJOR STRATA CHANGE

MINOR STRATA CHANGE

HOLE EXTENDED BY DRIVING 50 mm PIPE

\* PROBE OR SPLIT SPOON REFUSAL

LOCATION OF BORING APPROXIMATE DATE OF DRILLING  
4 JULY 1976 ALSO, DATE WATER LEVEL NOTED

LOCATIONS GIVEN IN ILLINOIS WEST ZONE STATE PLANE COORDINATES (NAD 83) IN METERS

**NOTE:**

FOR LOCATIONS OF BORINGS, SEE SHEET C2.

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

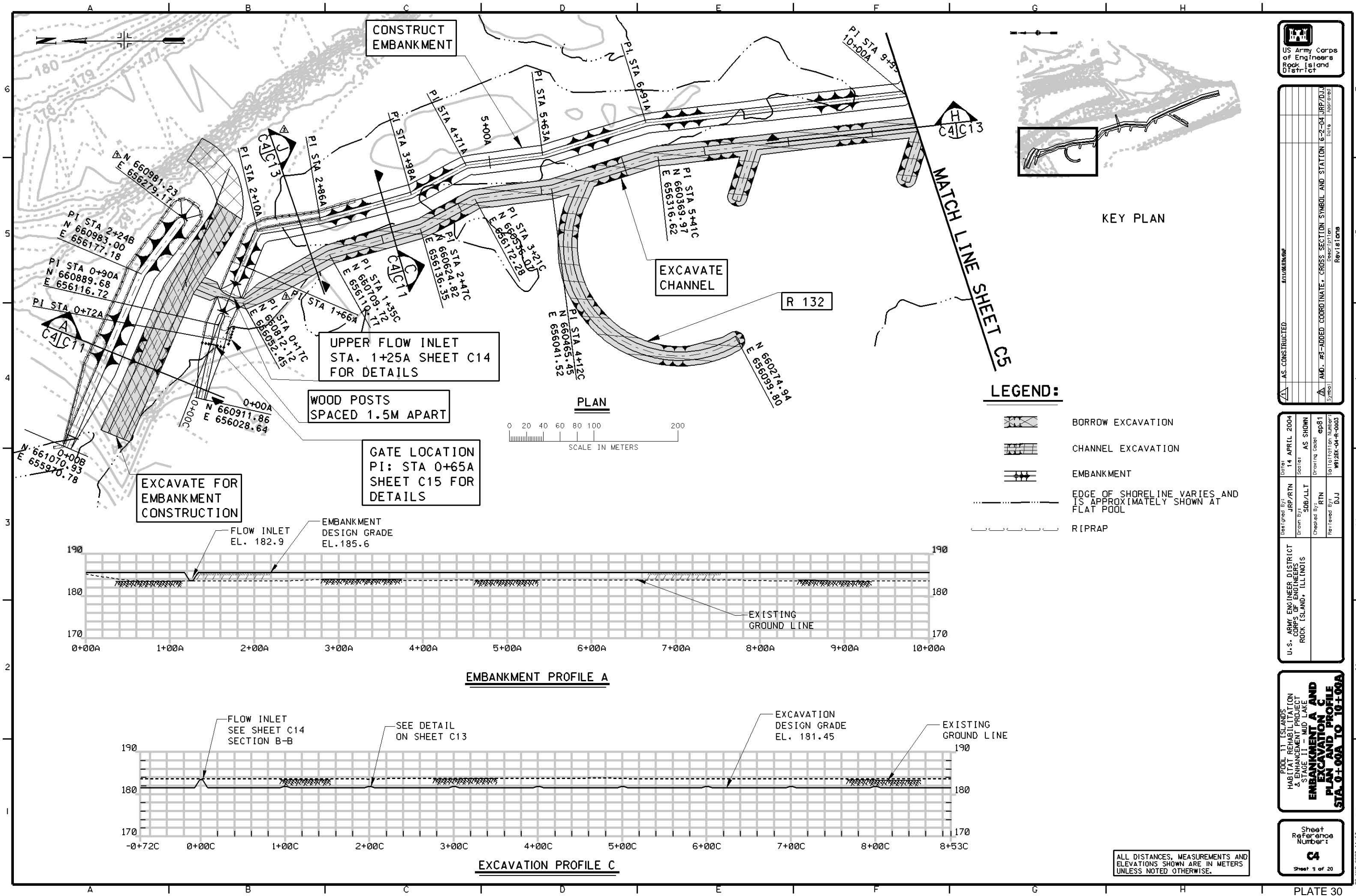


AS-CONSTRUCTED	DATE	APPROVED
AS SHOWN	DATE	APPROVED
AMOD. #3-ADDED COORDINATE, CROSS SECTION SYMBOL AND STATION	DATE	APPROVED
Symbol	Description	Revised

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	DATE: 14 APRIL 2004	AS SHOWN	ep81
DESIGNED BY: JRP/RTN	DRAWN BY: SDB/LLT	CHECKED BY: RTN	REVIEWED BY: DJJ
			W112EK-04-R-0003

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**EMBANKMENT A AND  
EXCAVATION C  
PLAN AND PROFILE  
STA. 0+00A TO 10+00A**

Sheet Reference Number:  
**4**  
Sheet 9 of 20



CONSTRUCT EMBANKMENT

EXCAVATE CHANNEL

UPPER FLOW INLET  
STA. 1+25A SHEET C14  
FOR DETAILS

WOOD POSTS  
SPACED 1.5M APART

GATE LOCATION  
PI: STA 0+65A  
SHEET C15 FOR  
DETAILS

EXCAVATE FOR  
EMBANKMENT  
CONSTRUCTION

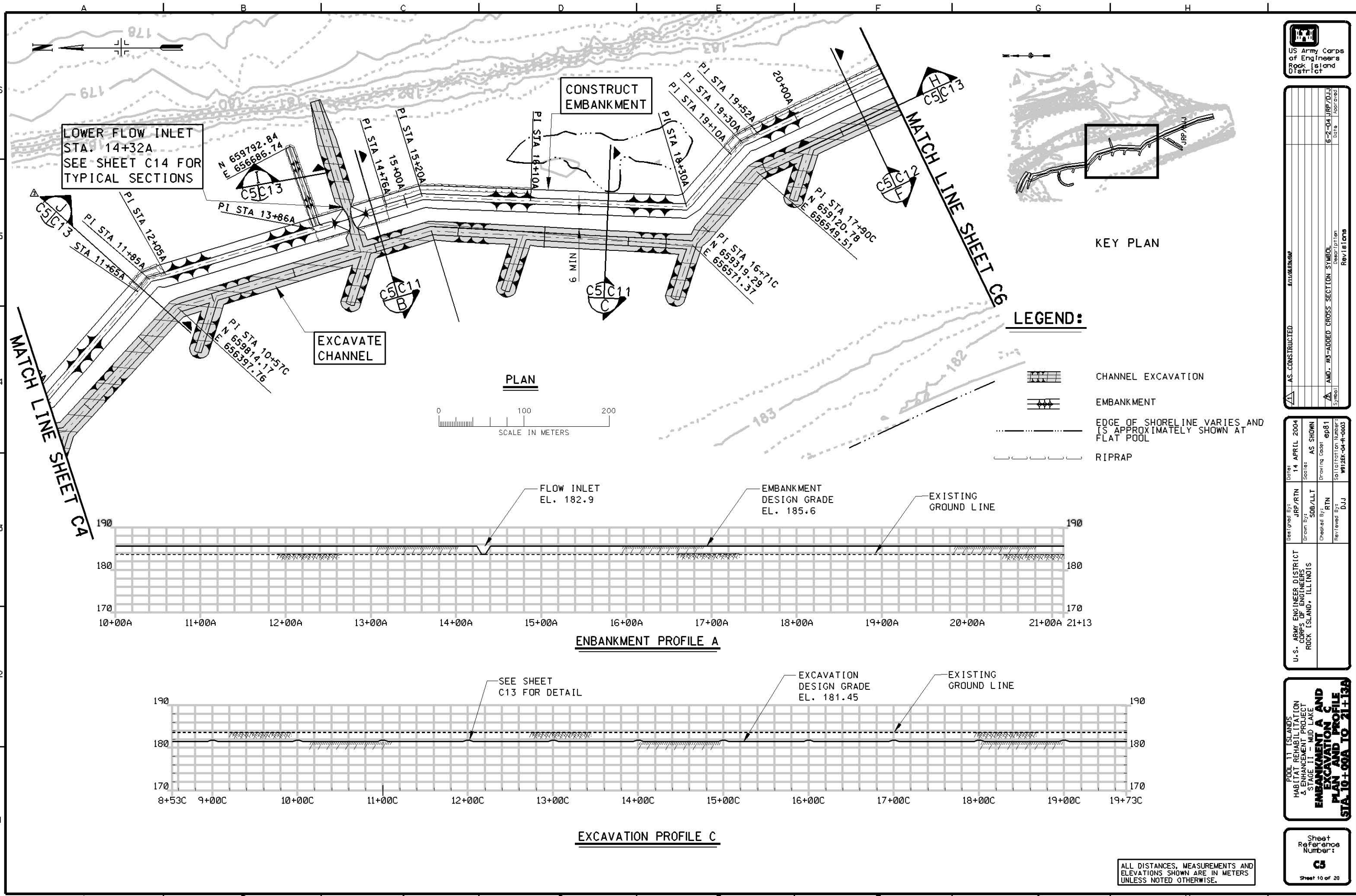
**LEGEND:**

- BORROW EXCAVATION
- CHANNEL EXCAVATION
- EMBANKMENT
- EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
- RIPRAP

**EMBANKMENT PROFILE A**

**EXCAVATION PROFILE C**

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



US Army Corps of Engineers  
Rock Island District

AS - CONSTRUCTED	DATE	BY	APPROVED
	6-2-04	JRP/DJJ	

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Date: 14 APRIL 2004	Status: AS SHOWN	ep81
	Designed By: JRP/RTN	AS SHOWN	
	Drawn By: SDB/LLT		
	Checked By: RTN		
	Reviewed By: DJJ		

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**EMBANKMENT A AND  
EXCAVATION C  
PLAN AND PROFILE  
STA. 10+00A TO 21+13A**

Sheet Reference Number:  
**G5**  
Sheet 10 of 20

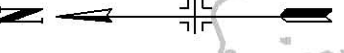
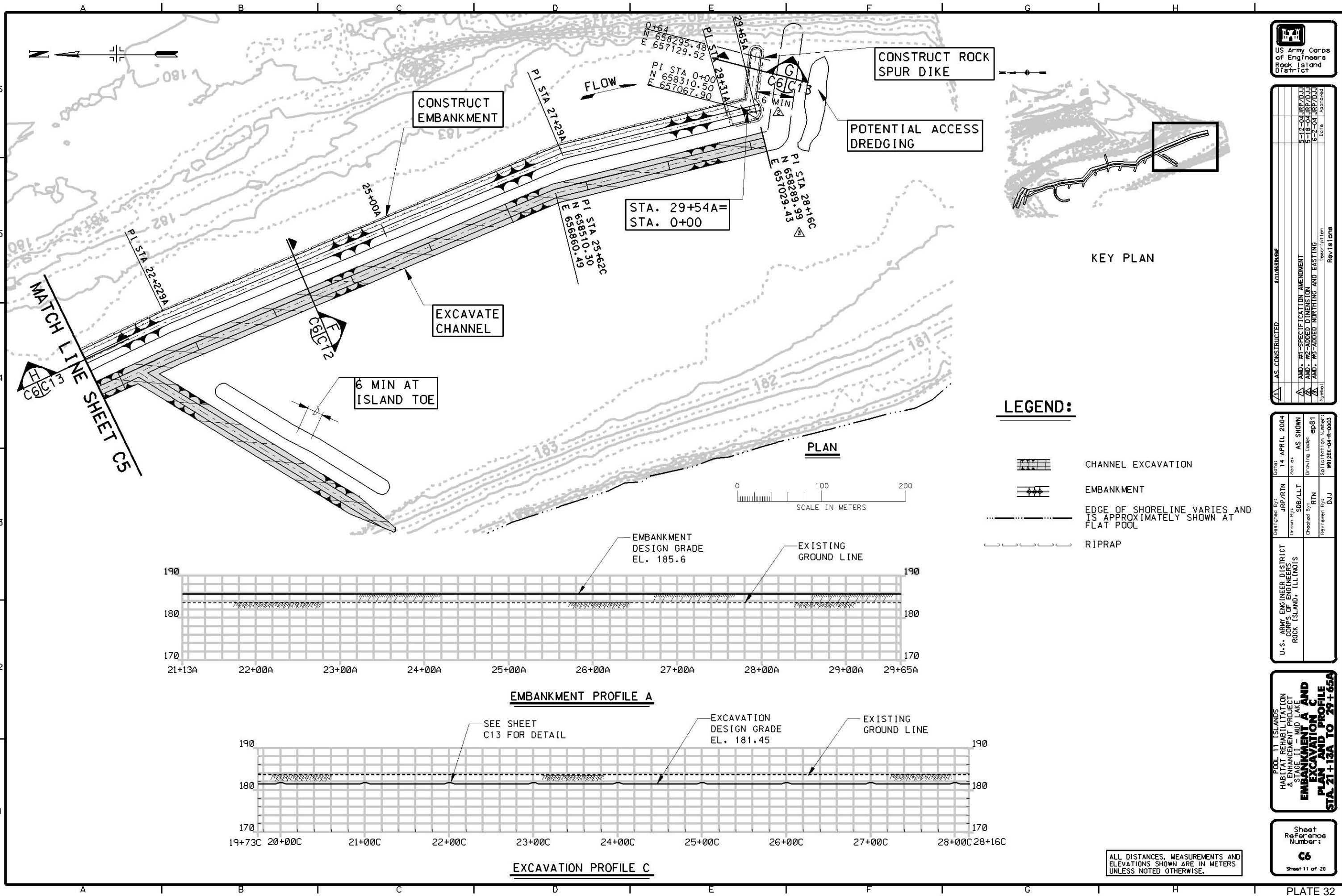
ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

AS CONSTRUCTED	DATE	APPROVED
AS SHOWN	5-12-04 JRP/DJJ	
ADD. #1-SPECIFICATION AMENDMENT	5-18-04 JRP/DJJ	
ADD. #2-ADDED DIMENSION	6-2-04 JRP/DJJ	
ADD. #3-ADDED NORTHING AND EASTING		

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: JRP/RTN	Date: 14 APRIL 2004
	Drawn By: SDG/LLT	Scale: AS SHOWN
	Checked By: RTN	Drawing Code: ep81
	Reviewed By: DJJ	Specification Number: W12EK-04-R-0003

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 11 MUD LAKE  
**EMBANKMENT A AND  
EXCAVATION C  
PLAN AND PROFILE  
STA. 21+13A TO 29+65A**

Sheet Reference Number:  
**C6**  
Sheet 11 of 20



MATCH LINE SHEET C5

CONSTRUCT EMBANKMENT

CONSTRUCT ROCK SPUR DIKE

POTENTIAL ACCESS DREDGING

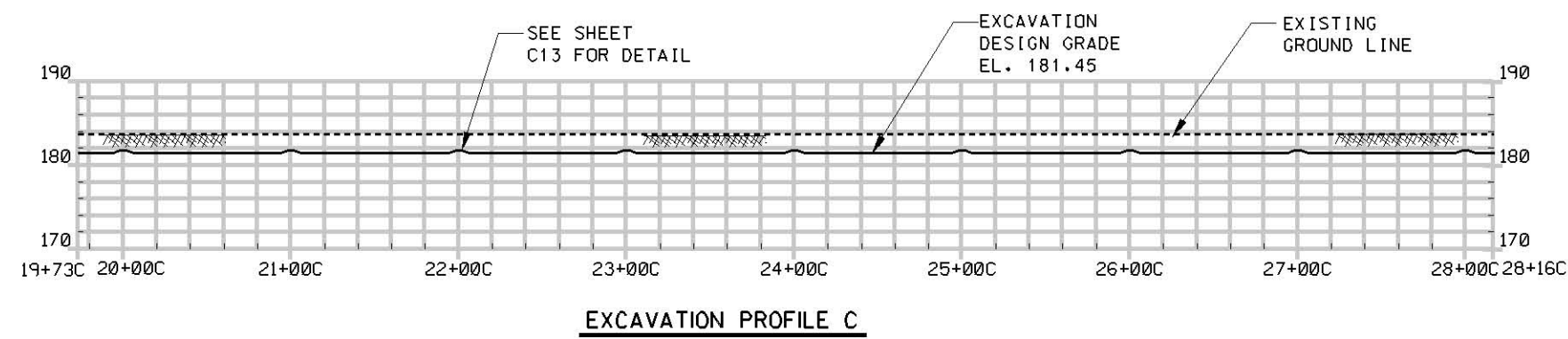
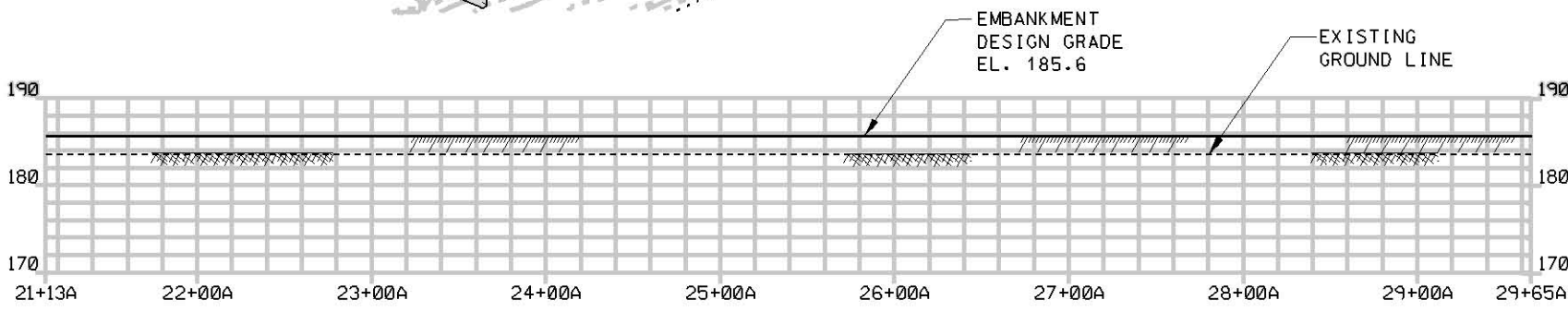
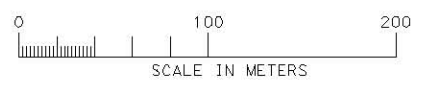
EXCAVATE CHANNEL

6 MIN AT ISLAND TOE

STA. 29+54A = STA. 0+00

**LEGEND:**

- CHANNEL EXCAVATION
- EMBANKMENT
- EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
- RIPRAP



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

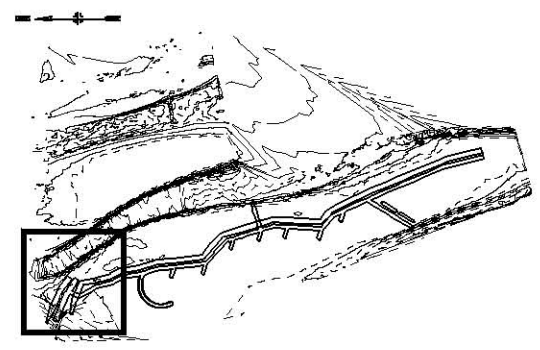
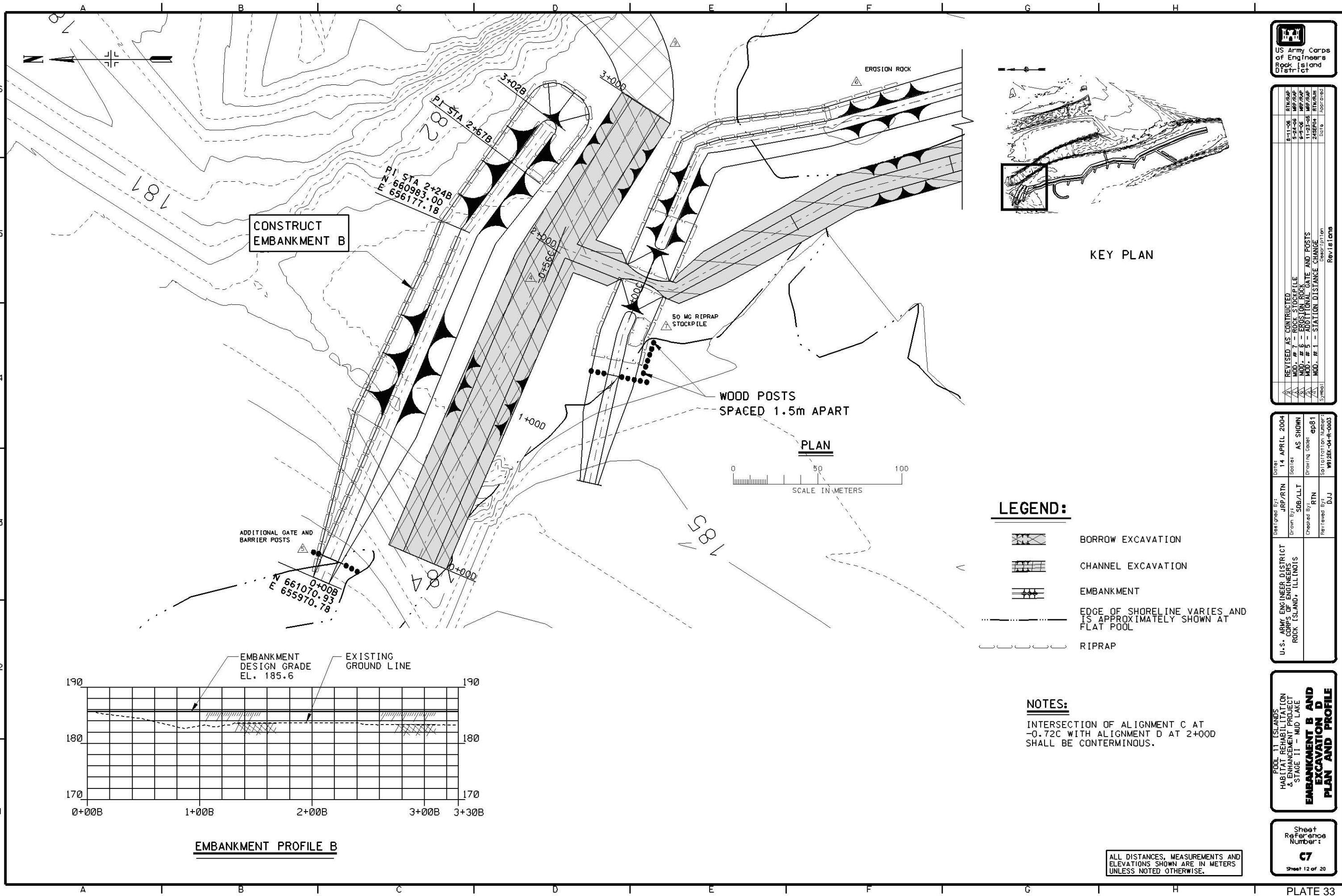


Symbol	Description	Date	Approved
▲	REVISAS AS CONSTRUCTED		
▲	MOD. # 1 - ROCK STOCKPILE	8-11-08	RTN/RAP
▲	MOD. # 2 - EROSION ROCK	8-24-08	RTN/RAP
▲	MOD. # 3 - ADDITIONAL GATE AND POSTS	8-29-08	RTN/RAP
▲	MOD. # 4 - STATION DISTANCE CHANGE	11-23-08	RTN/RAP
▲	MOD. # 5 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 6 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 7 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 8 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 9 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 10 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 11 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 12 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 13 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 14 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 15 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 16 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 17 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
▲	MOD. # 18 - STATION DISTANCE CHANGE	24SEP04	RTN/RAP
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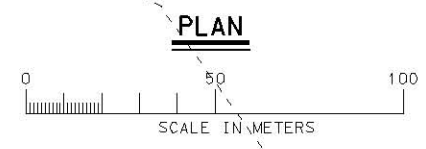
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: JRP/RTN Drawn By: SDB/LLT Checked By: RTN Reviewed By: DJJ	Date: 14 APRIL 2004 Scale: AS SHOWN Drawing Code: ep81 Revision Number: W12EK-04-R-0003
----------------------------------------------------------------------------	----------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**EMBANKMENT B AND  
EXCAVATION D  
PLAN AND PROFILE**

Sheet  
Reference  
Number:  
**C7**  
Sheet 12 of 20



KEY PLAN

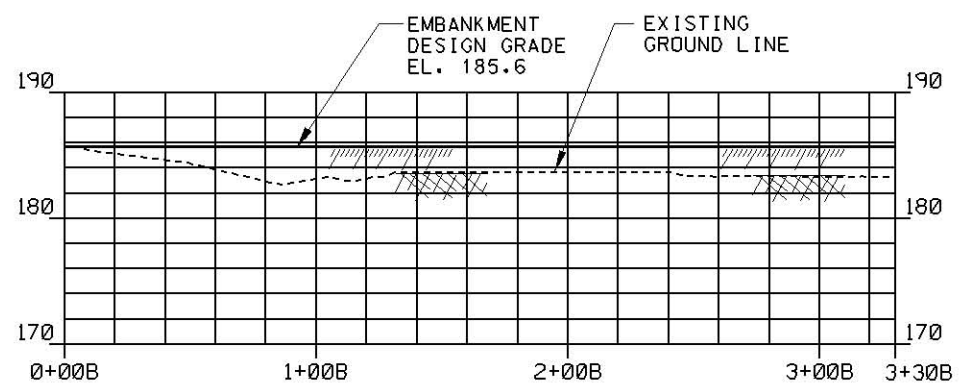


**LEGEND:**

- BORROW EXCAVATION
- CHANNEL EXCAVATION
- EMBANKMENT
- EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
- RIPRAP

**NOTES:**  
INTERSECTION OF ALIGNMENT C AT -0.72C WITH ALIGNMENT D AT 2+00D SHALL BE CONTERMINOUS.

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



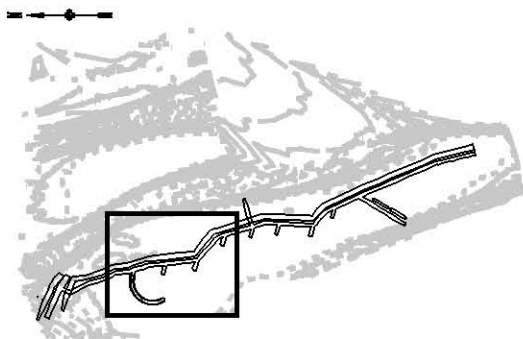
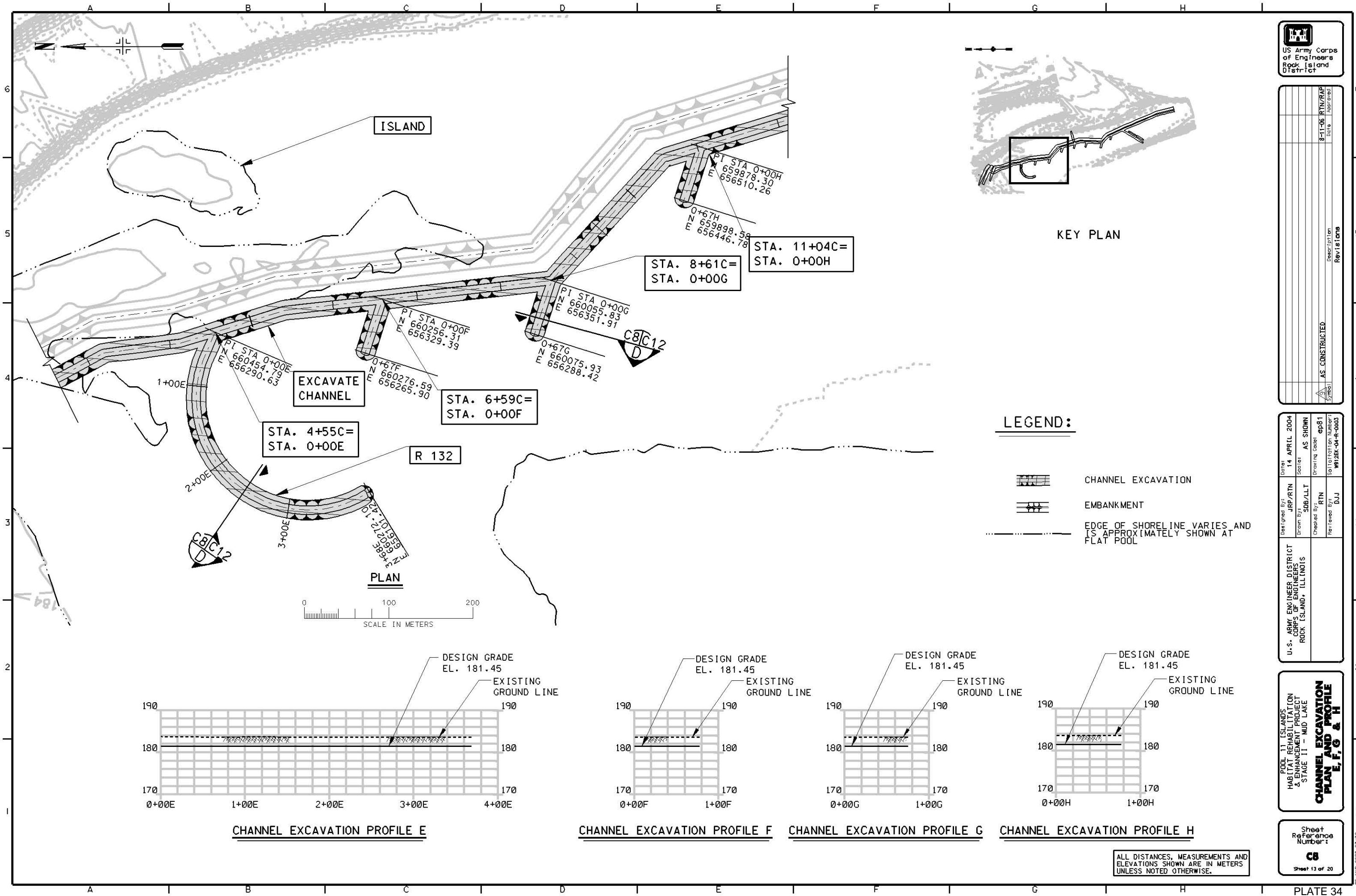
**EMBANKMENT PROFILE B**

Symbol	AS CONSTRUCTED	Description	Revisions
			8-11-06 RTN/RAP Date Approved

Date:	14 APRIL 2004
Designed By:	JRP/RTN
Drawn By:	SDB/LLT
Checked By:	RTN
Reviewed By:	DJJ
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	AS SHOWN Drawing Code: ep81 Specification Number: W12EK-04-R-0003

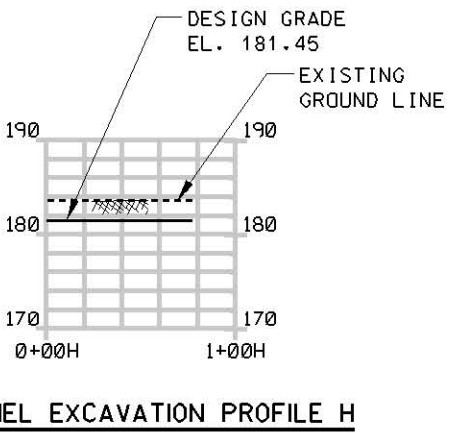
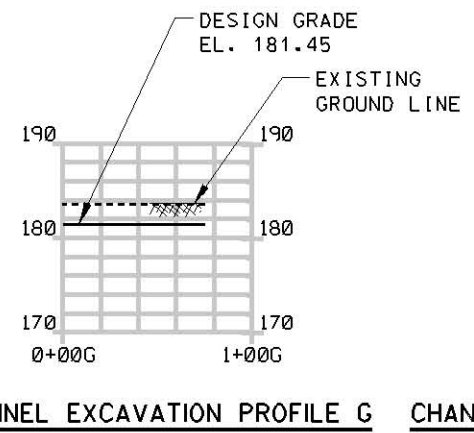
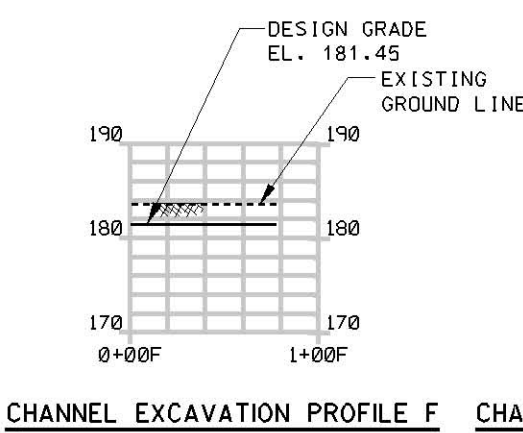
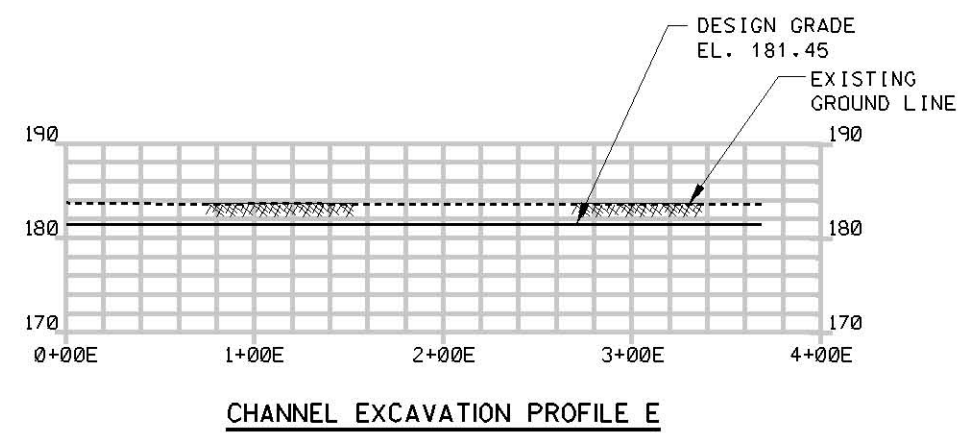
POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILE  
E, F, G & H**

Sheet Reference Number:  
**CB**  
Sheet 13 of 20



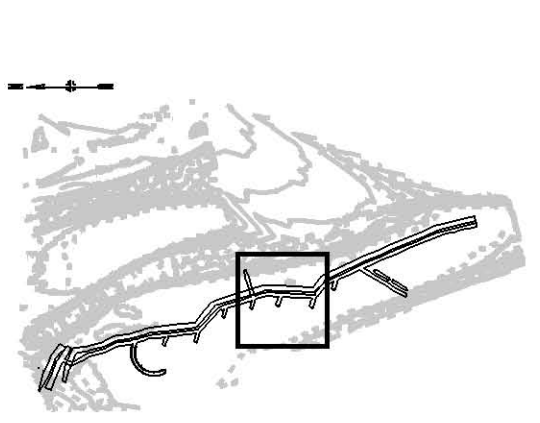
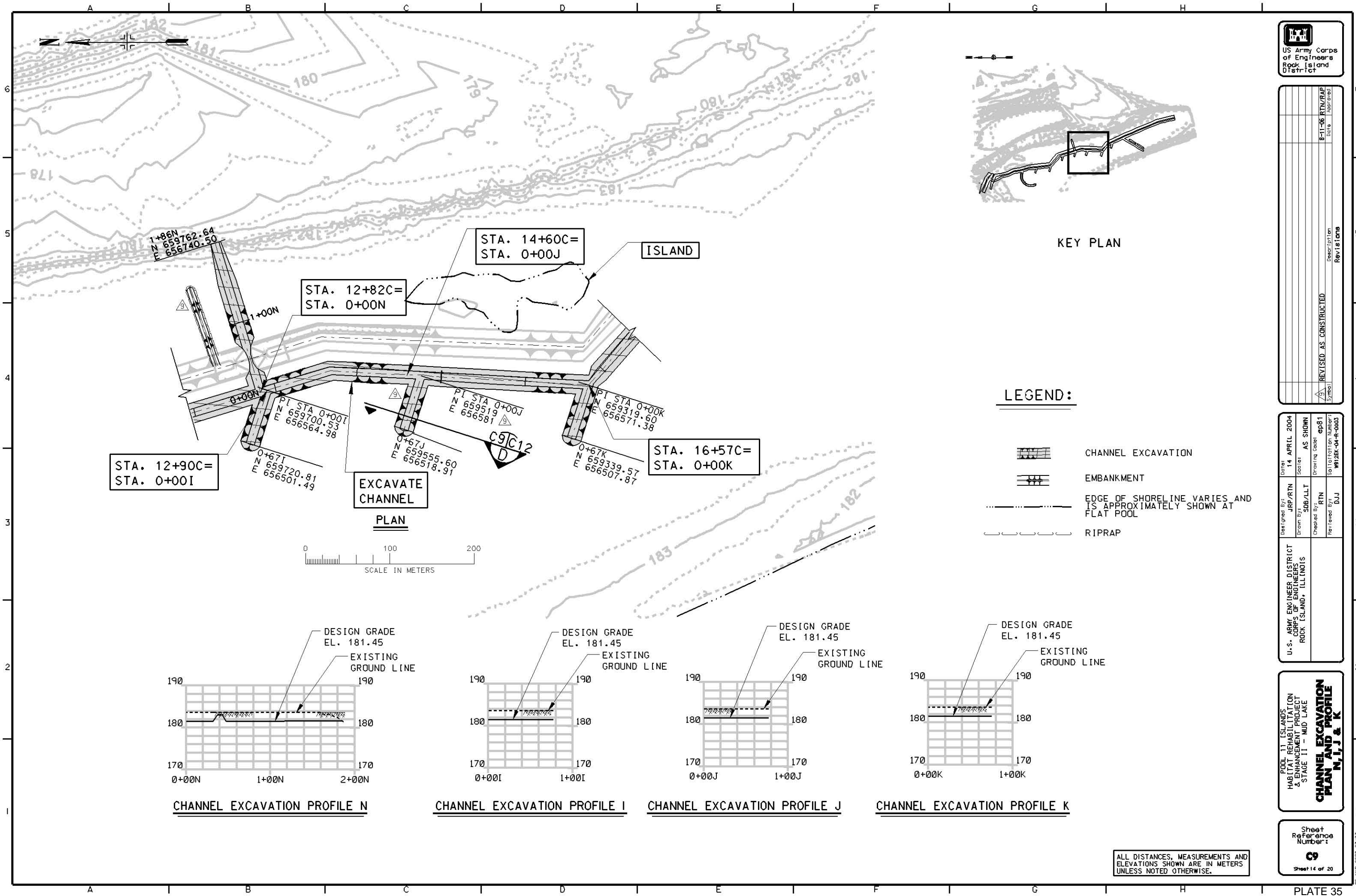
**LEGEND:**

	CHANNEL EXCAVATION
	EMBANKMENT
	EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.





**LEGEND:**

- CHANNEL EXCAVATION
- EMBANKMENT
- EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
- RIPRAP

STA. 12+90C = STA. 0+00I

EXCAVATE CHANNEL PLAN

STA. 14+60C = STA. 0+00J

ISLAND

STA. 12+82C = STA. 0+00N

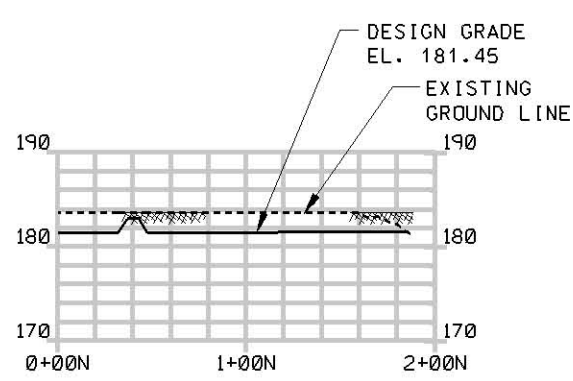
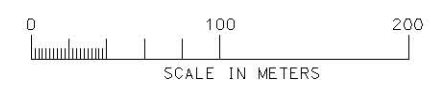
PI STA 0+00J  
N 659519  
E 656581

STA. 16+57C = STA. 0+00K

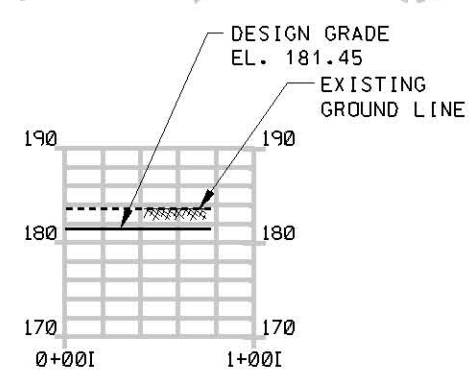
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E 656564.98

PI STA 0+00J  
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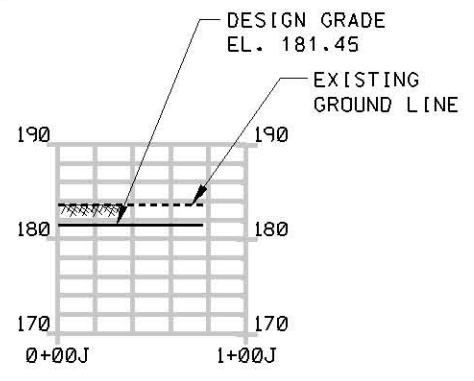
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E 656571.38



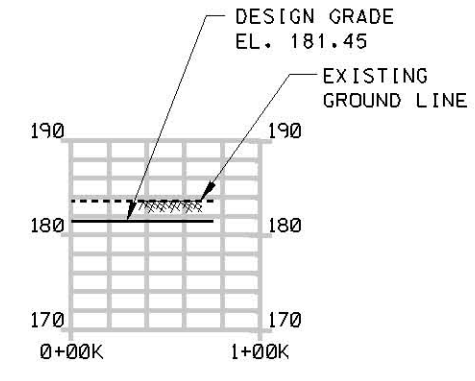
CHANNEL EXCAVATION PROFILE N



CHANNEL EXCAVATION PROFILE I



CHANNEL EXCAVATION PROFILE J



CHANNEL EXCAVATION PROFILE K

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



Symbol	8-11-06 RTN/RAP	Date	Approved
REVISION	AS CONSTRUCTED	Description	Revision

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: JRP/RTN	Date: 14 APRIL 2004
	Drawn By: SDB/LLT	Scale: AS SHOWN
	Checked By: RTN	Drawing Code: ep81
	Reviewed By: DJJ	Specification Number: W12EK-04-R-0003

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILE  
N, I, J & K**

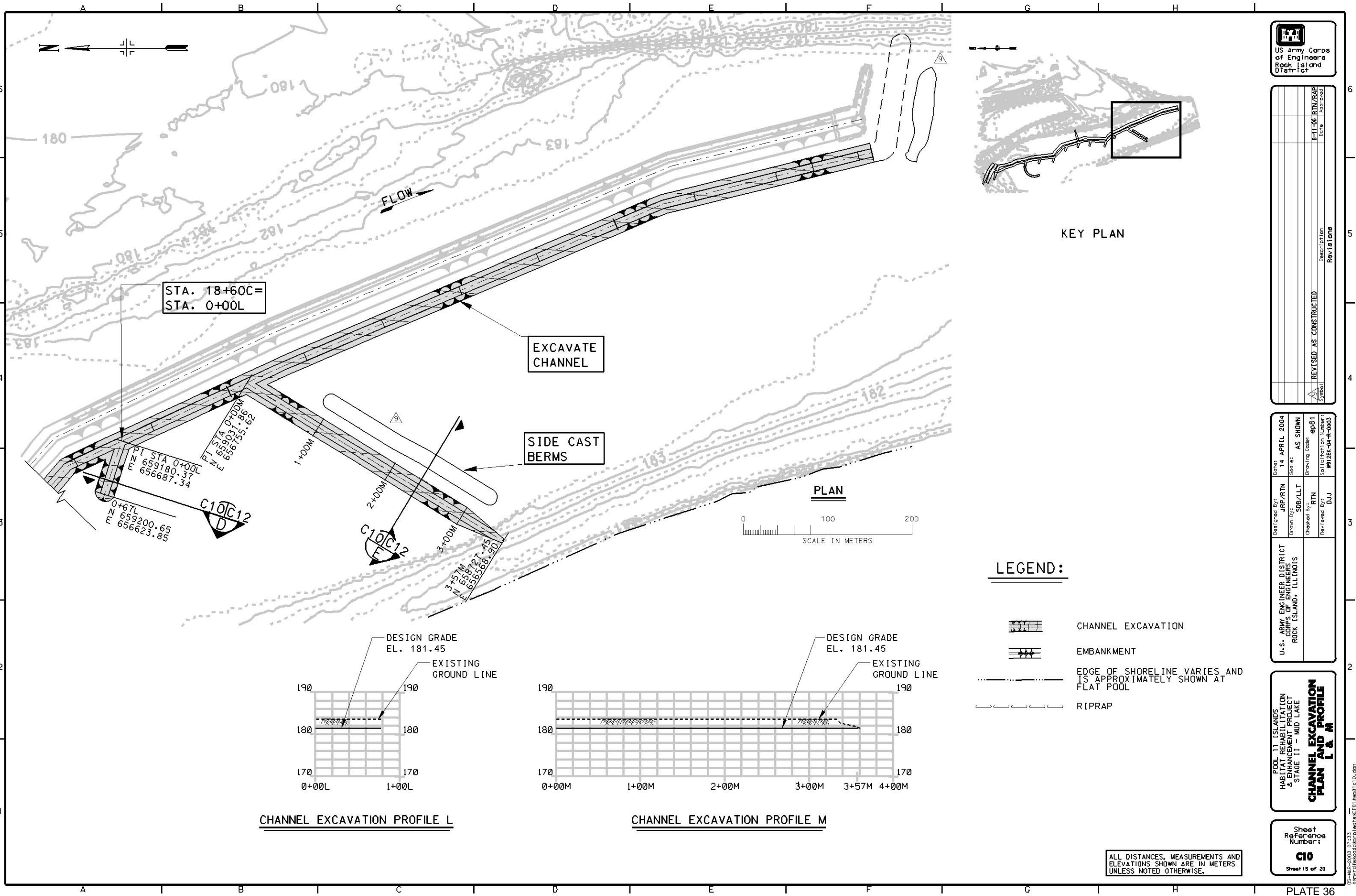
Sheet Reference Number:  
**9**  
Sheet 14 of 20

Symbol	REVISED AS CONSTRUCTED	Description	Rev 16 LOTS
Date	8-11-06	RTN/RAP	Approved

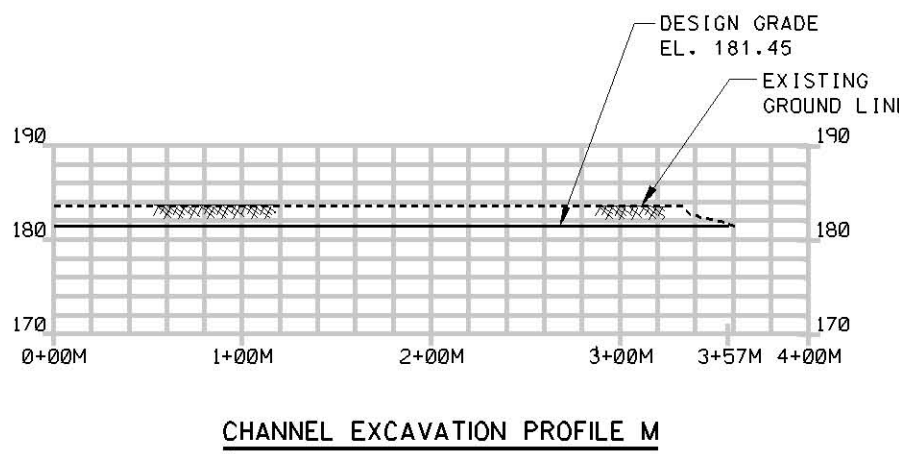
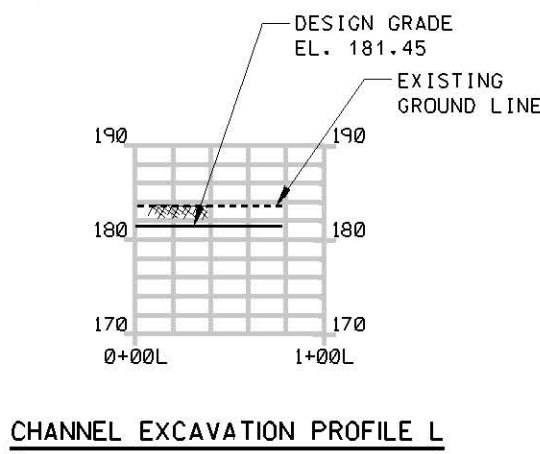
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: JRP/RTN	Date: 14 APRIL 2004
	Drawn By: SDB/LLT	Scale: AS SHOWN
	Checked By: RTN	Drawing Code: ep81
	Reviewed By: DJJ	Specification Number: W12EK-04-R-0003

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**CHANNEL EXCAVATION  
PLAN AND PROFILE**

Sheet Reference Number:  
**C10**  
Sheet 15 of 20



- LEGEND:**
- CHANNEL EXCAVATION
  - EMBANKMENT
  - EDGE OF SHORELINE VARIES AND IS APPROXIMATELY SHOWN AT FLAT POOL
  - RIPRAP



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

Symbol	AS CONSTRUCTED
Description	Revisions
Date	8-11-06 RTN/RAJ
Approved	

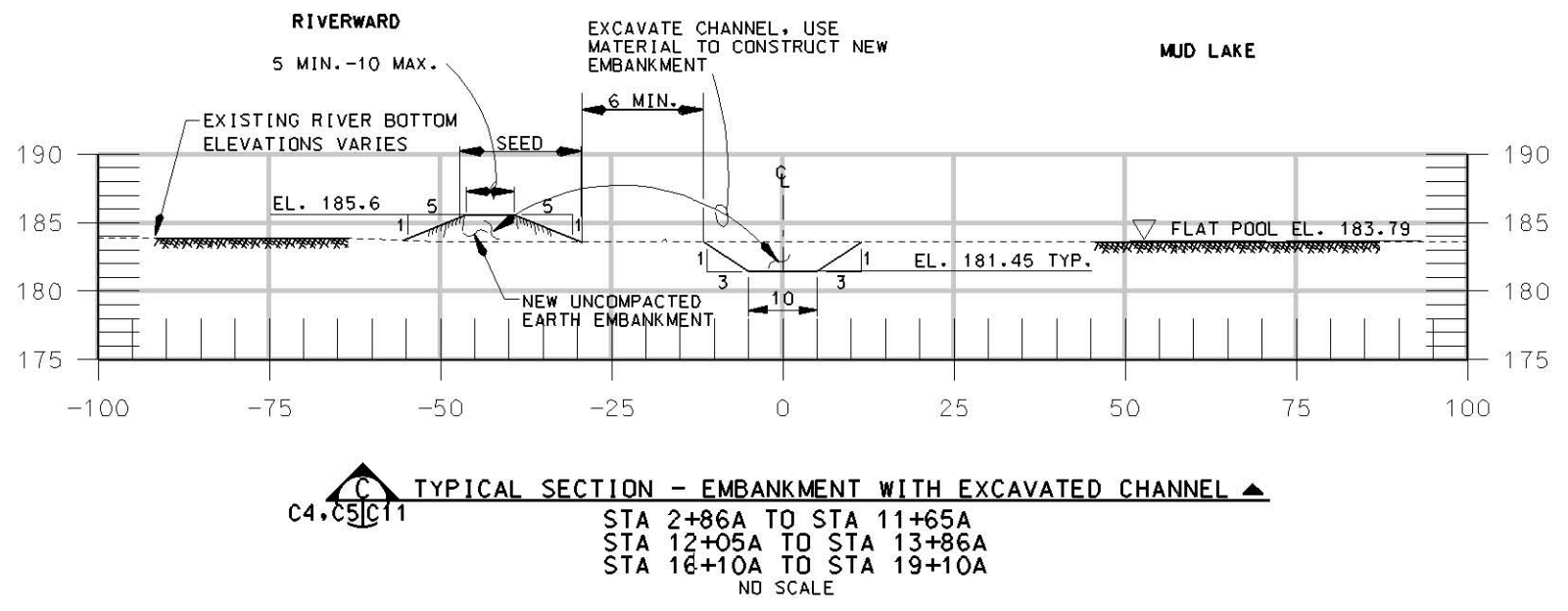
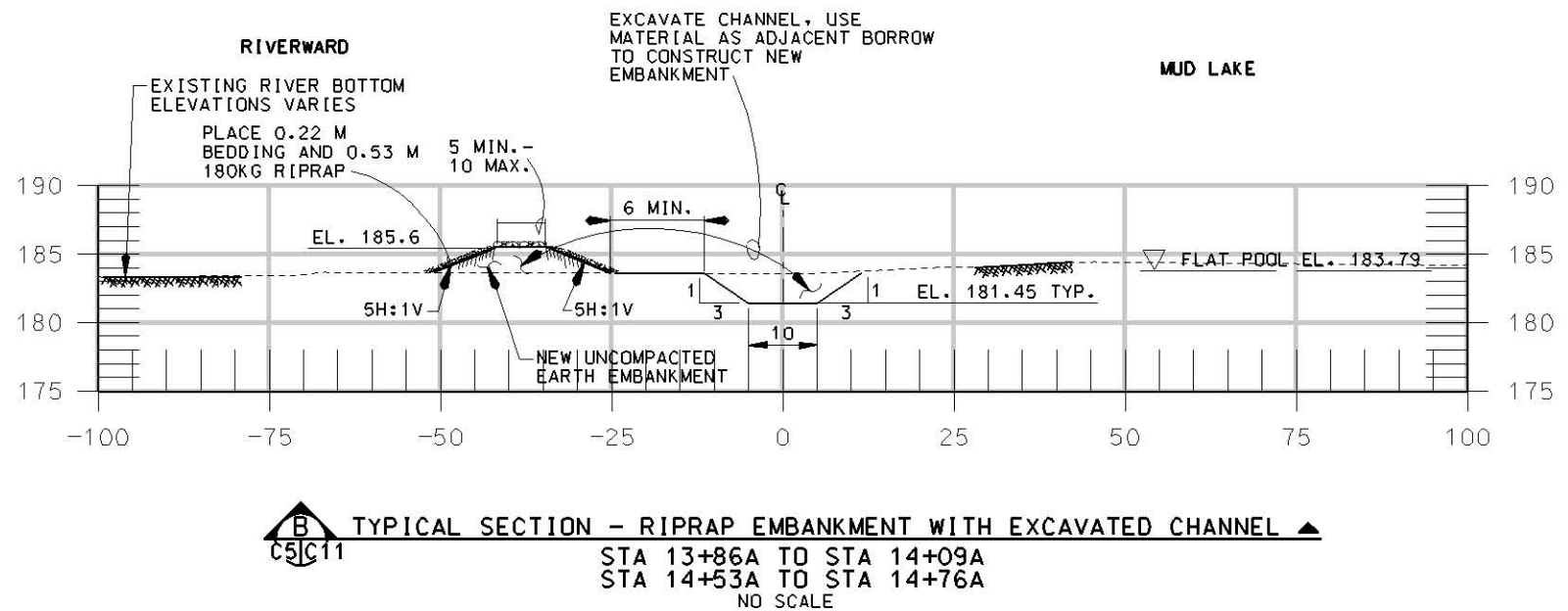
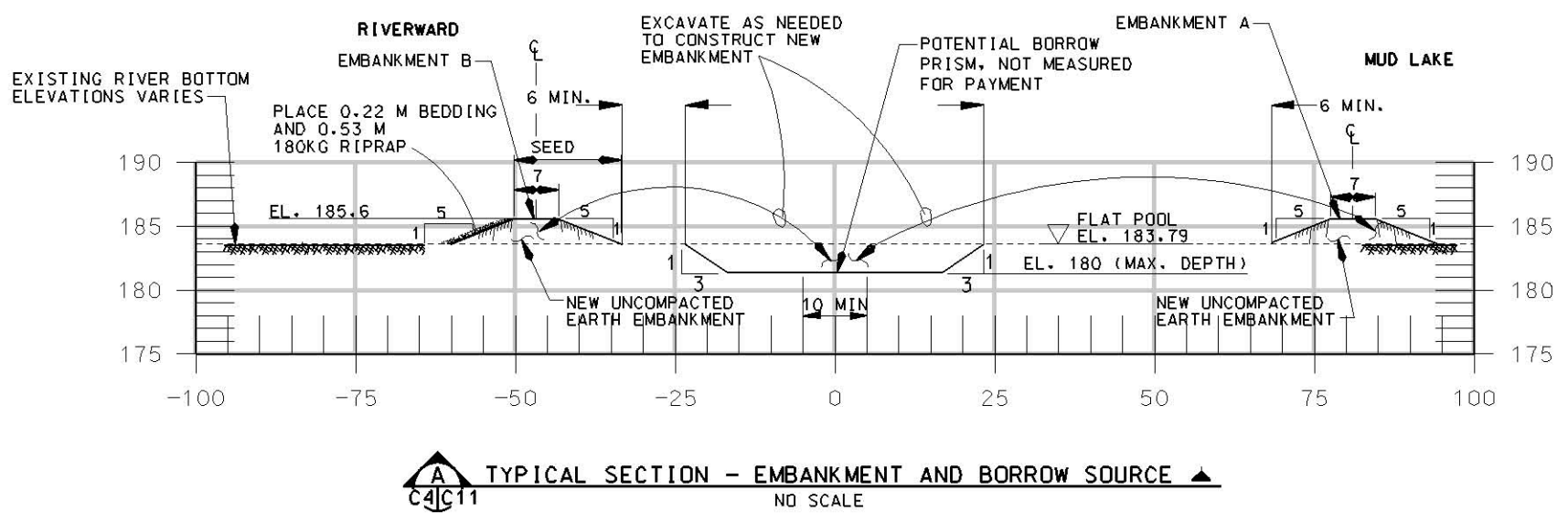
Date:	14 APRIL 2004
Designed By:	JRP/RTN
Drawn By:	SDB/LLT
Checked By:	RTN
Reviewed By:	DJJ
Scale:	AS SHOWN
Drawing Code:	ep81
Specification Number:	W12EK-04-R-0003

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE

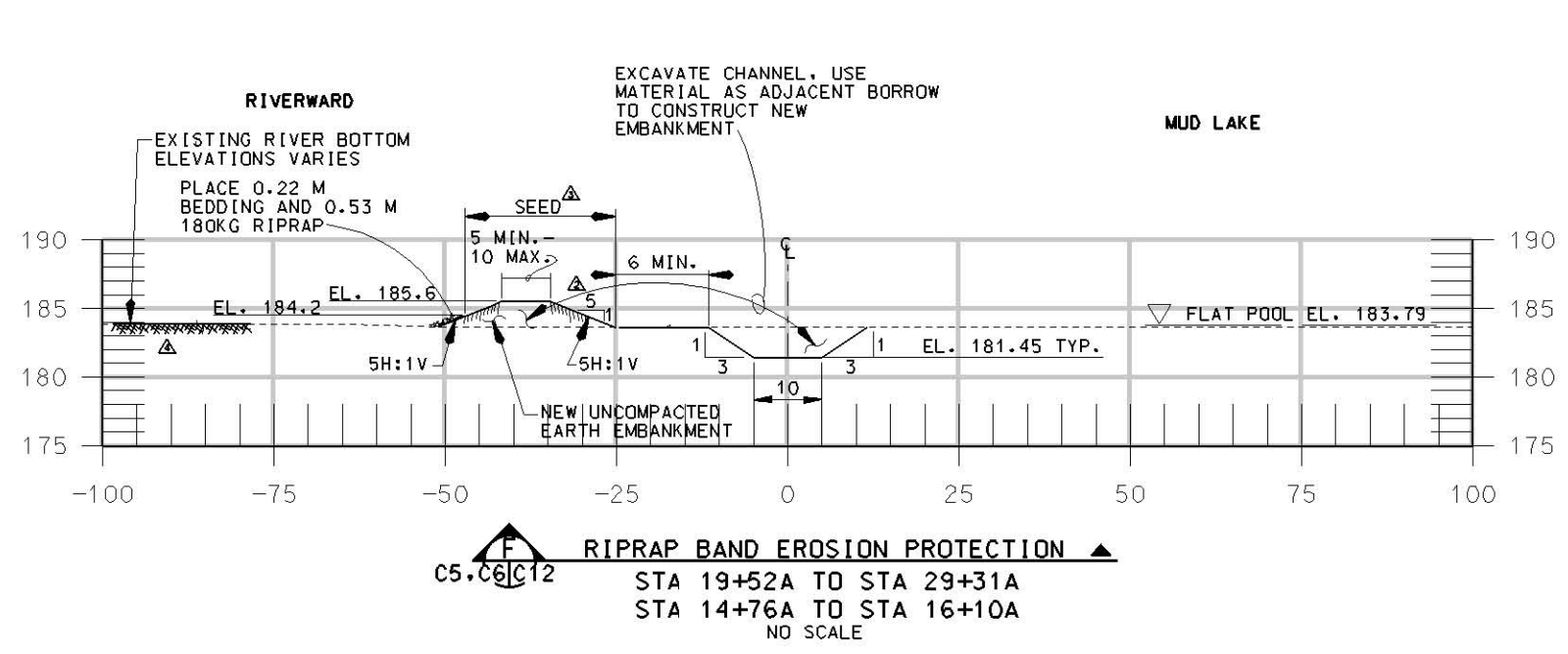
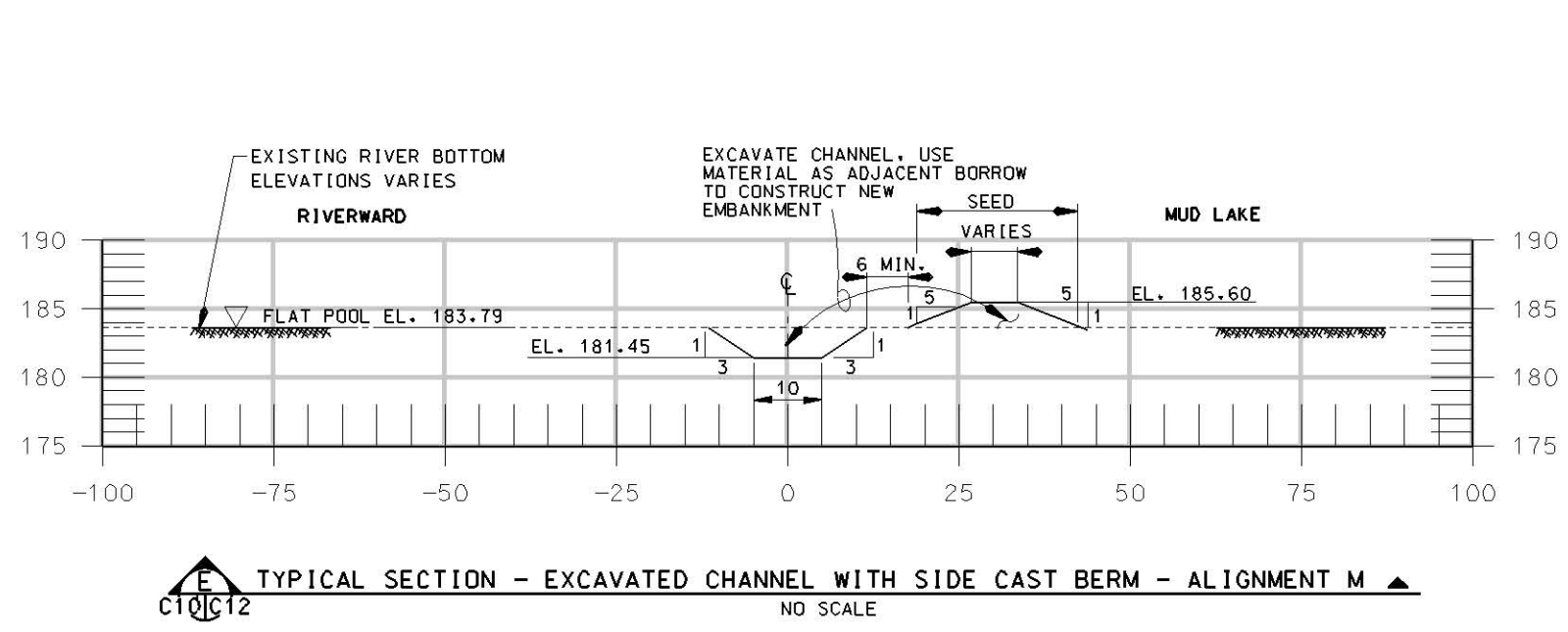
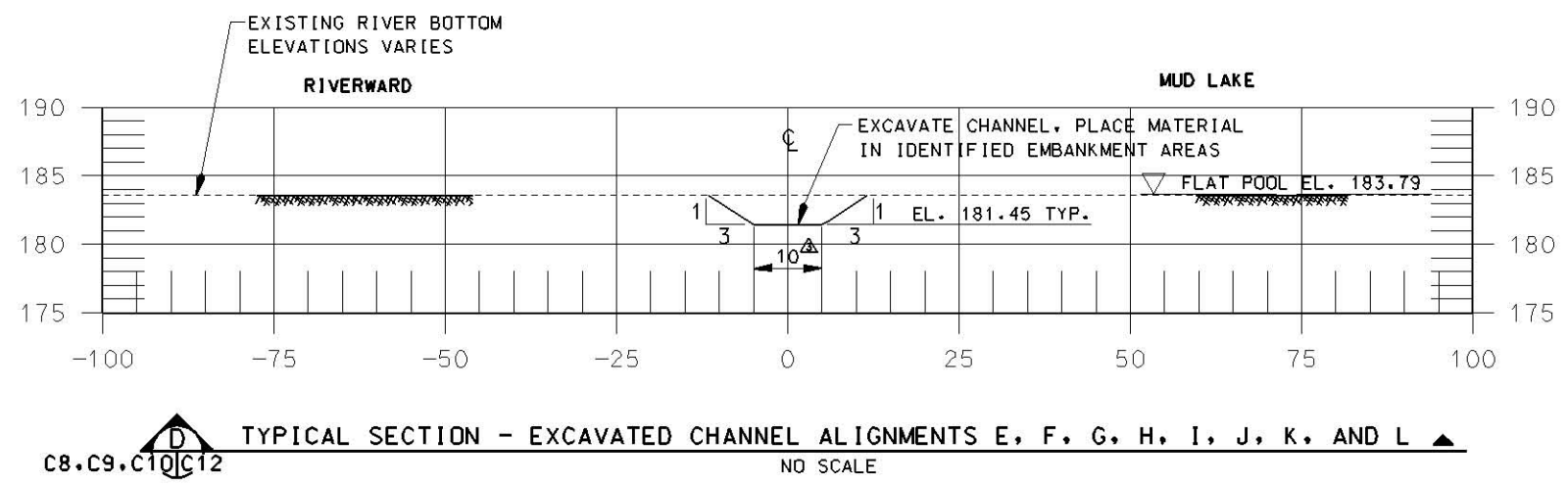
**TYPICAL SECTIONS  
A, B AND C**

Sheet Reference Number:  
**C11**  
Sheet 16 of 20



- NOTES:
1. ALL SLOPES ON EMBANKMENTS SHALL BE 5 (MIN.) : 1.
  2. SEEDING SHALL EXTEND TO BOUNDARY OF RIPRAP OR NORMAL WATERLINE.
  3. ABOVE ELEVATION 183.79 M, 0.53 M RIPRAP SHALL BE PLACED ON 0.22 M BEDDING STONE.
  4. BELOW ELEVATION 183.79 M, 0.65 M RIPRAP SHALL BE PLACED ON 0.35 M BEDDING STONE.

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



- NOTES:
1. ALL SLOPES ON EMBANKMENTS SHALL BE 5 (MIN.) : 1.
  2. SEEDING SHALL EXTEND TO BOUNDARY OF RIPRAP OR NORMAL WATERLINE.
  3. ABOVE ELEVATION 183.79 M, 0.53 M RIPRAP SHALL BE PLACED ON 0.22 M BEDDING STONE.
  4. BELOW ELEVATION 183.79 M, 0.65 M RIPRAP SHALL BE PLACED ON 0.35 M BEDDING STONE.

Symbol	Description	Date	Approved
▲	AS CONSTRUCTED		
▲	AMENDMENT #1 - SPECIFICATION AMENDMENT	8-11-06 RTN/RTN	
▲	AMENDMENT #2 - SLOPE LABEL CORRECTION	5-12-04 LRP/DJJ	
▲	AMENDMENT #3 - DIMENSION AND SEEDING CORRECTION	5-18-04 LRP/DJJ	
▲	MINOR REVISION	5-2-04 LRP/DJJ	
▲		5-9-05 LRP/RTN	

U.S. ARMY ENGINEER DISTRICT	DESIGNED BY:	DATE:
ROCK ISLAND DISTRICT	JRP/RTN	14 APRIL 2004
ILLINOIS	SDG/LLT	
	RTN	
	DJJ	
	AS SHOWN	
	ep81	
	W12EK-04-R-0003	

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**MUD LAKE**  
**TYPICAL SECTIONS**  
**D, E AND F**

Sheet Reference Number:  
**C12**  
Sheet 17 of 20

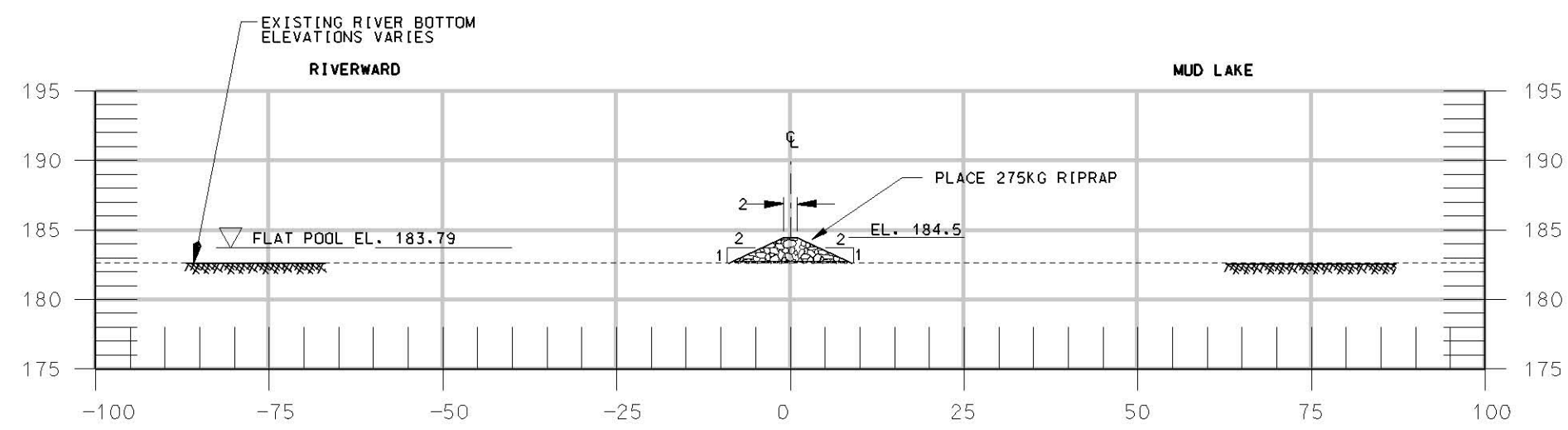
ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

Symbol	AS CONSTRUCTED	AS CONSTRUCTED TYPICAL SECTION J AND NOTES	8-11-06 RTN/RAP	6-2-04 JRP/DJJ	Approved
Revision			Date	Date	Rev 18

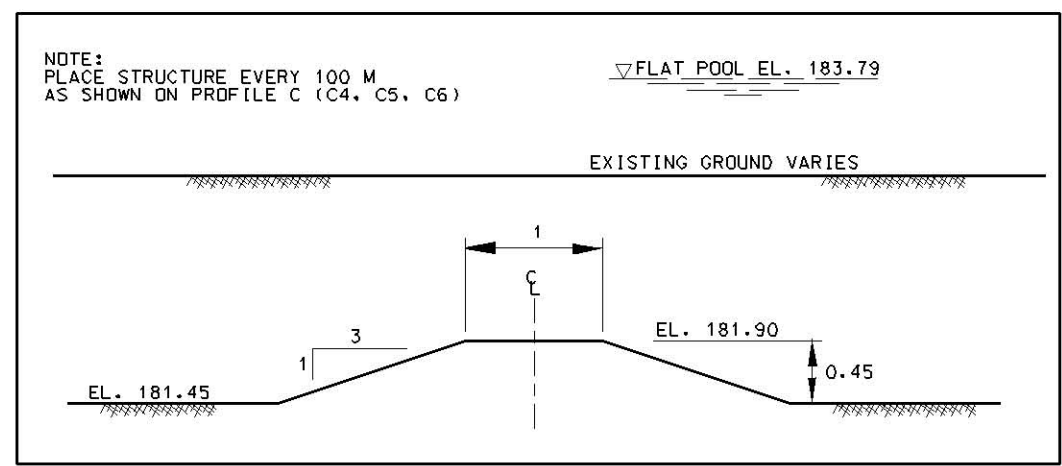
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designated By: JRP/RTN	Drawn By: SDB/LLT	Checked By: RTN	Reviewed By: DJJ	Date: 14 APRIL 2004	Scale: AS SHOWN	Drawing Code: ep81	Sheet Title: W12EK-04-R-0003
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POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**TYPICAL SECTIONS  
G, H, I AND J**

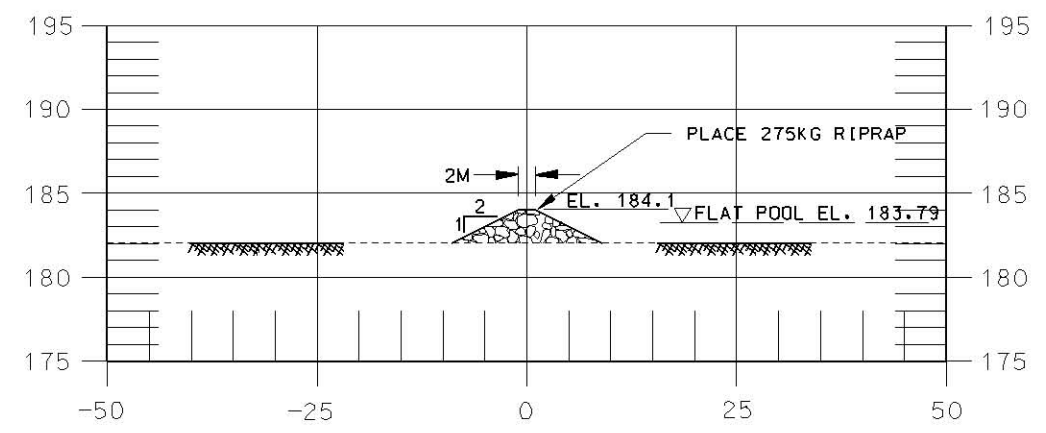
Sheet Reference Number:  
**C13**  
Sheet 18 of 20



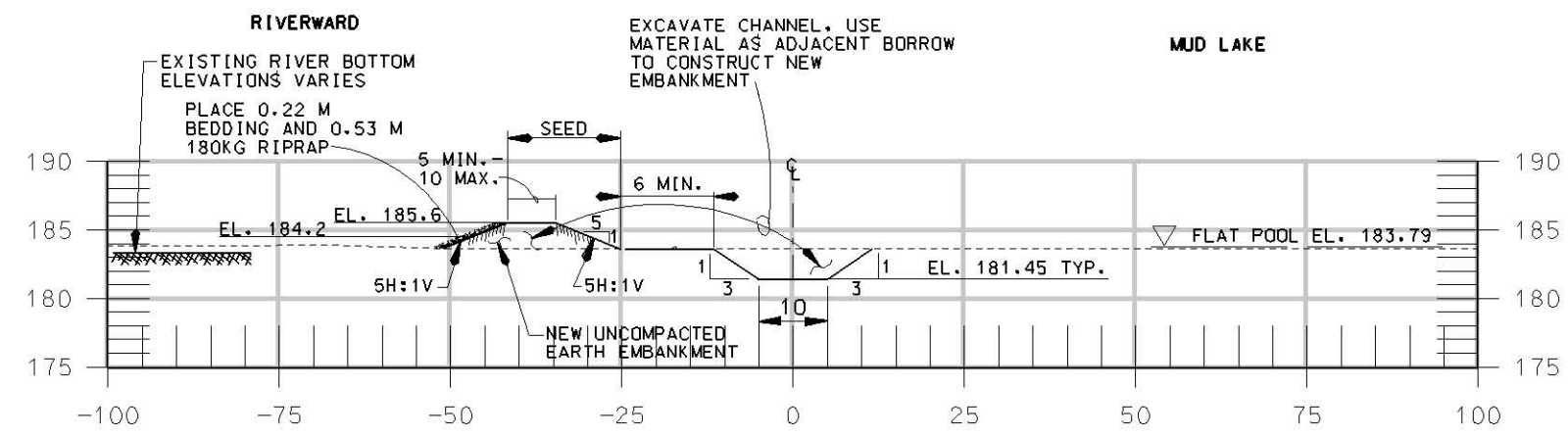
**G**  
C6/C13  
**ROCK SPUR DIKE SECTION**  
NO SCALE



**H**  
C4, C5, C6/C13  
**TYPICAL SECTION - DEPTH DIVERSITY STRUCTURE**  
NO SCALE



**I**  
C5/C13  
**TYPICAL SECTION - RIPRAP EMBANKMENT**  
NO SCALE



**J**  
C4, C5/C13  
**TYPICAL SECTION - RIPRAP EMBANKMENT**  
NO SCALE

- NOTES:
- ALL SLOPES ON EMBANKMENTS SHALL BE 5 (MIN.) : 1.
  - SEEDING SHALL EXTEND TO BOUNDARY OF RIPRAP OR NORMAL WATERLINE.
  - ABOVE ELEVATION 183.79 M, 0.53 M RIPRAP SHALL BE PLACED ON 0.22 M BEDDING STONE.
  - BELOW ELEVATION 183.79 M, 0.65 M RIPRAP SHALL BE PLACED ON 0.35 M BEDDING STONE.

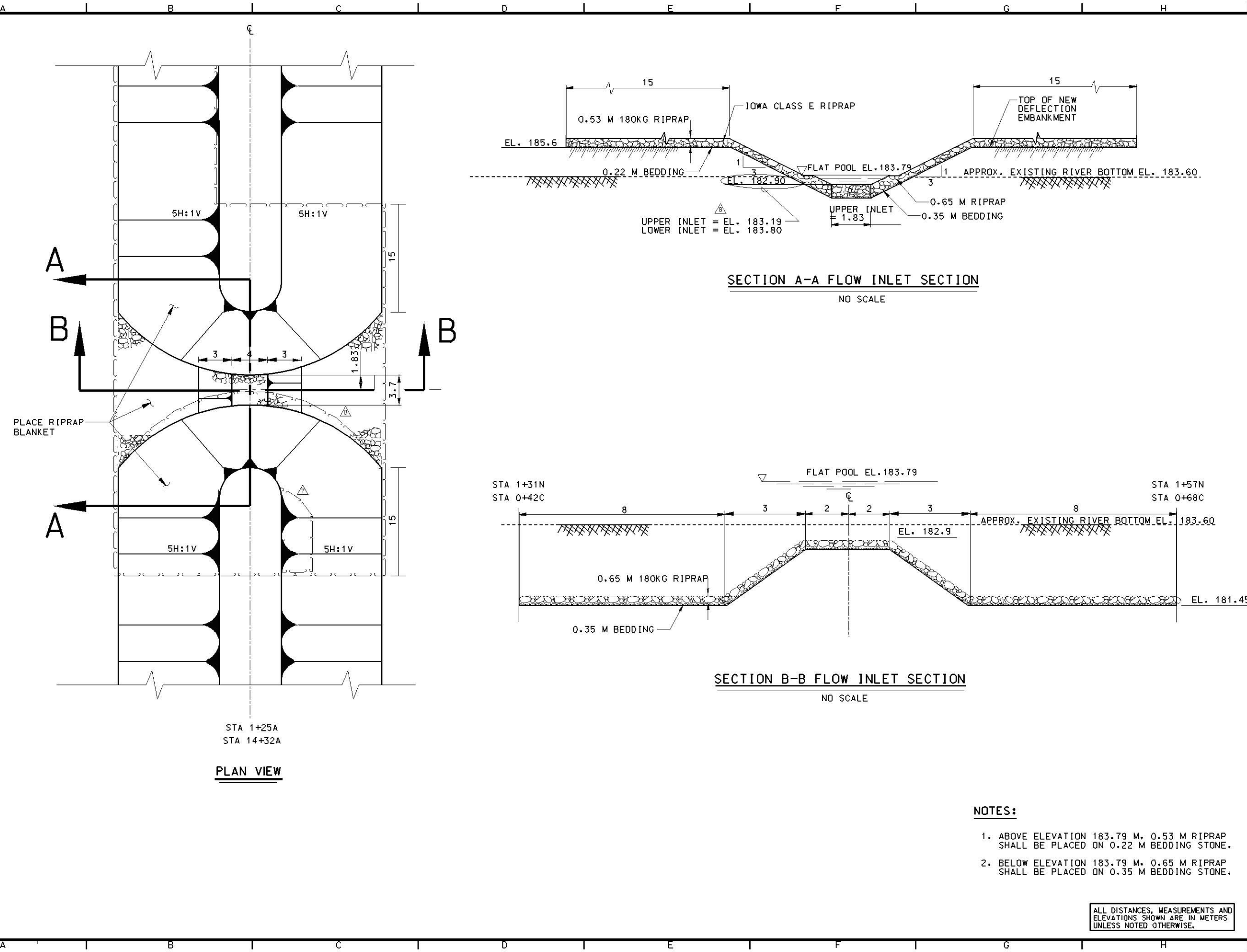
ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

8-11-06	RTN/RAP	Approved
5-2-06	RTN/RAP	
5-24-06	RTN/RAP	
AS CONSTRUCTED	ADDITIONAL RIPRAP	
MDD88	- RIPRAP STOCKPILE	
MDD87	- RIPRAP STOCKPILE	
Symbol	Description	Revision
		10/18

Date:	14 APRIL 2004
Designed By:	JRP/RTN
Drawn By:	SDB/LLT
Checked By:	RTN
Reviewed By:	DJJ
Scale:	AS SHOWN
Drawing Code:	ep81
Specification Number:	W12EK-04-R-0003
U.S. ARMY ENGINEER DISTRICT	
CORPS OF ENGINEERS	
ROCK ISLAND DISTRICT	

POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE II - MUD LAKE  
**TYPICAL FLOW  
INLET DETAILS**

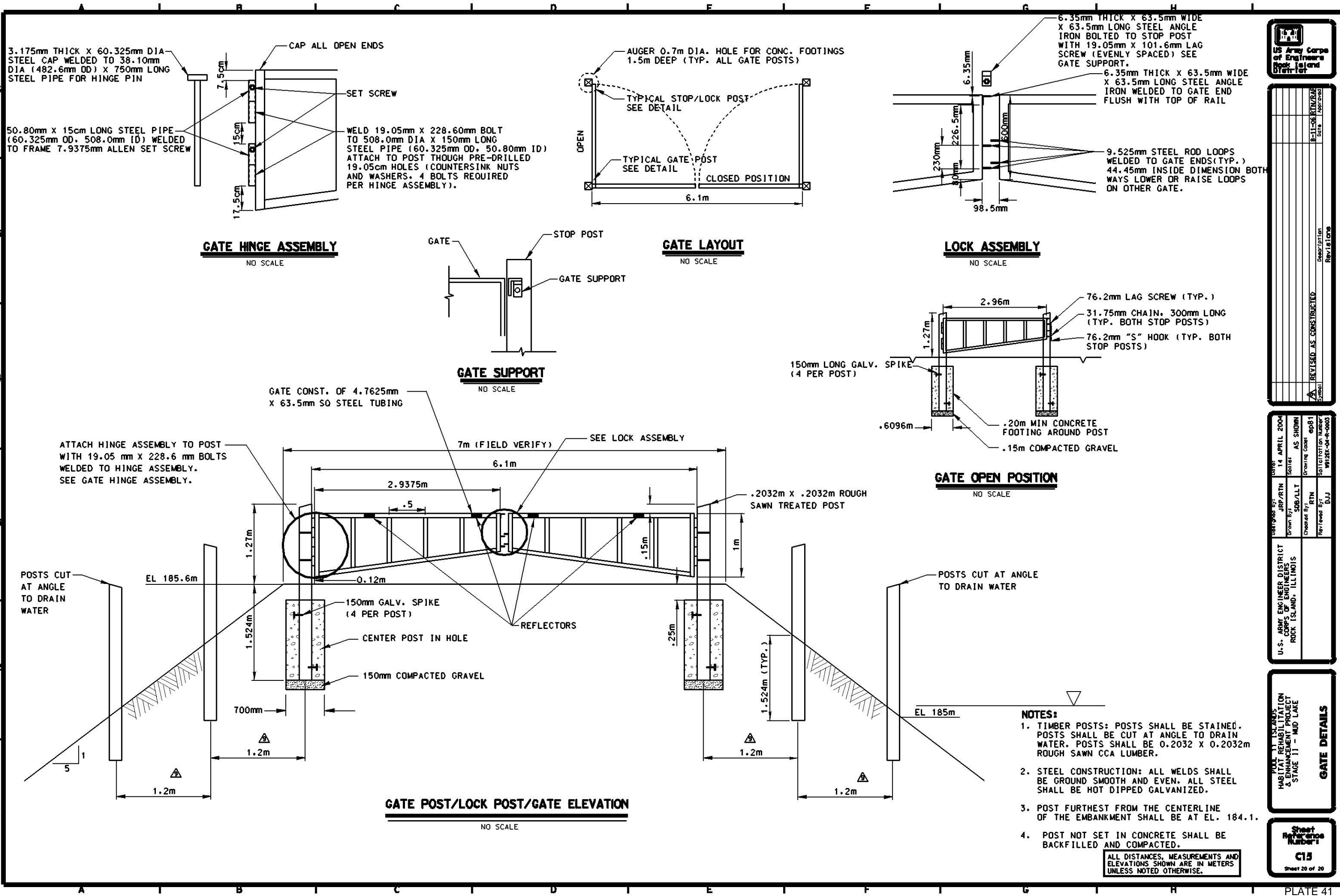
Sheet Reference Number:  
**C14**  
Sheet 19 of 20



- NOTES:**
1. ABOVE ELEVATION 183.79 M, 0.53 M RIPRAP SHALL BE PLACED ON 0.22 M BEDDING STONE.
  2. BELOW ELEVATION 183.79 M, 0.65 M RIPRAP SHALL BE PLACED ON 0.35 M BEDDING STONE.

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.





Symbol	Description	Revision
1	REVISED AS CONSTRUCTED	8-11-06 RIN/RAE

DATE:	14 APRIL 2004
DESIGNED BY:	JRP/RTN
DRAWN BY:	SDG/LLT
CHECKED BY:	RTN
REVIEWED BY:	DJJ
SCALE:	AS SHOWN
DRAWING CODE:	ep81
PROJECT NUMBER:	WH12E-04-R-0003

U.S. ARMY ENGINEER DISTRICT  
CORP OF ENGINEERS  
ROCK ISLAND, ILLINOIS

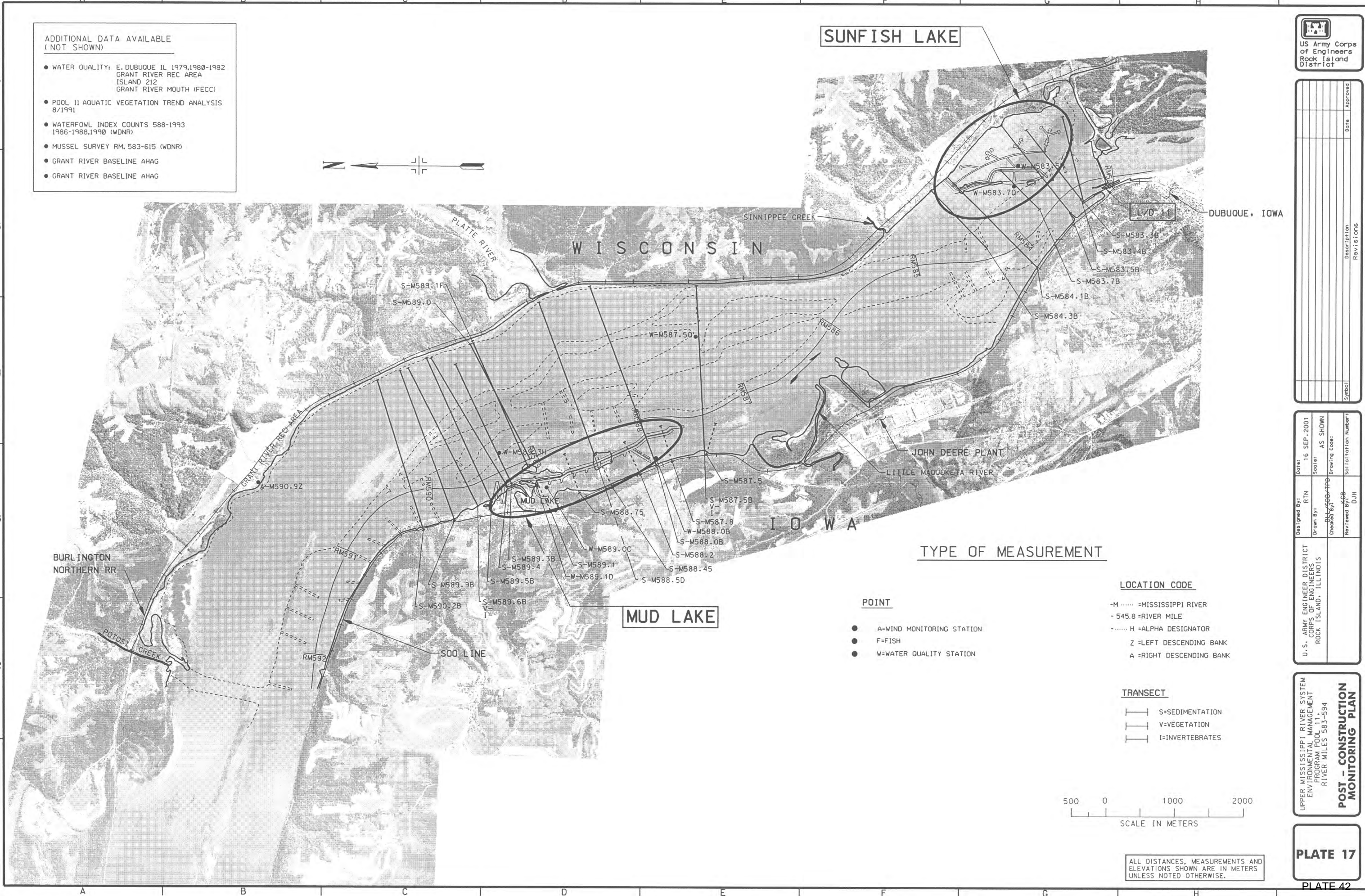
POOL 11 ISLANDS  
HABITAT REHABILITATION  
& ENHANCEMENT PROJECT  
STAGE 11 - MUD LAKE

**GATE DETAILS**

Sheet Reference Number  
**C15**  
Sheet 20 of 20

- NOTES:**
1. TIMBER POSTS: POSTS SHALL BE STAINED. POSTS SHALL BE CUT AT ANGLE TO DRAIN WATER. POSTS SHALL BE 0.2032 X 0.2032m ROUGH SAWN CCA LUMBER.
  2. STEEL CONSTRUCTION: ALL WELDS SHALL BE GROUND SMOOTH AND EVEN. ALL STEEL SHALL BE HOT DIPPED GALVANIZED.
  3. POST FURTHEST FROM THE CENTERLINE OF THE EMBANKMENT SHALL BE AT EL. 184.1.
  4. POST NOT SET IN CONCRETE SHALL BE BACKFILLED AND COMPACTED.
- ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

- ADDITIONAL DATA AVAILABLE (NOT SHOWN)
- WATER QUALITY: E. DUBUQUE IL 1979, 1980-1982  
GRANT RIVER REC AREA  
ISLAND 212  
GRANT RIVER MOUTH (FECC)
  - POOL 11 AQUATIC VEGETATION TREND ANALYSIS  
8/1991
  - WATERFOWL INDEX COUNTS 588-1993  
1986-1988, 1990 (WDNR)
  - MUSSEL SURVEY RM. 583-615 (WDNR)
  - GRANT RIVER BASELINE AHAG
  - GRANT RIVER BASELINE AHAG



SUNFISH LAKE

WISCONSIN

IOWA

DUBUQUE, IOWA

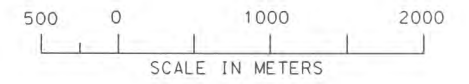
MUD LAKE

TYPE OF MEASUREMENT

- POINT**
- A=WIND MONITORING STATION
  - F=FISH
  - W=WATER QUALITY STATION

- LOCATION CODE**
- M ..... =MISSISSIPPI RIVER
  - 545.8 =RIVER MILE
  - ..... H =ALPHA DESIGNATOR
  - Z =LEFT DESCENDING BANK
  - A =RIGHT DESCENDING BANK

- TRANSECT**
- | | S=SEDIMENTATION
  - | | V=VEGETATION
  - | | I=INVERTEBRATES



ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.



Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Date: 16 SEP 2001
Drawn By: RTN	Scale: AS SHOWN
Created By: BJA/CEB/479	Drawing Code:
Reviewed By: DUH	Solicitation Number:

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT  
PROGRAM POOL 11  
RIVER MILES 583-594  
**POST - CONSTRUCTION  
MONITORING PLAN**





US Army Corps of Engineers  
Rock Island District

Symbol	Description	Revisions	Date	Approved

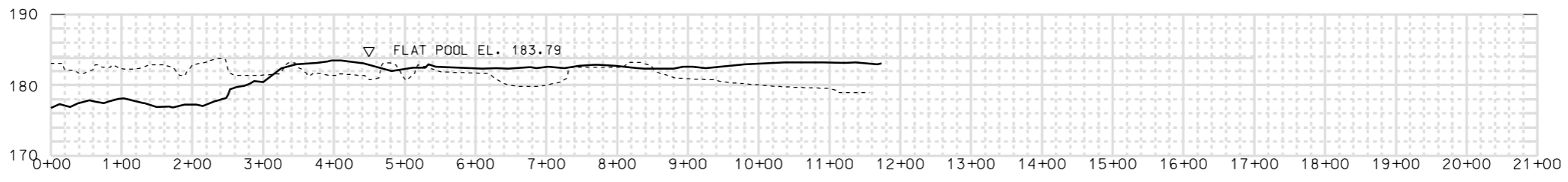
Designed By: RTN	Date: 16 SEP. 2001
Drawn By: SDB/TPD	Scale: AS SHOWN
Checked By: KGB	Drawing Code:
Reviewed By: DJH	Soil Transect Number:

U.S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS  
ROCK ISLAND, ILLINOIS

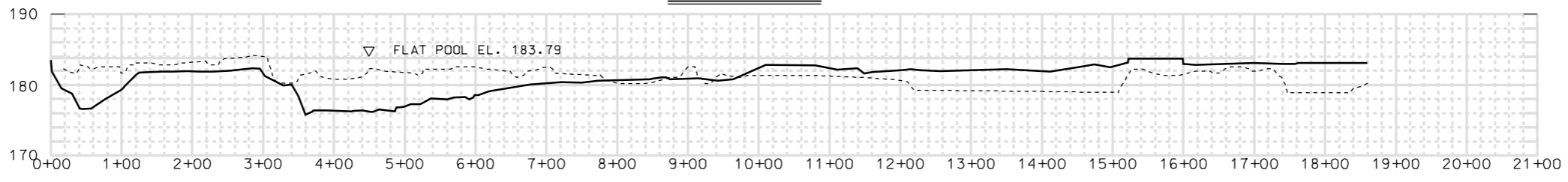
UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT  
PROGRAM POOL 11  
RIVER MILES 583-594

**SUNFISH LAKE  
TRANSECTS**

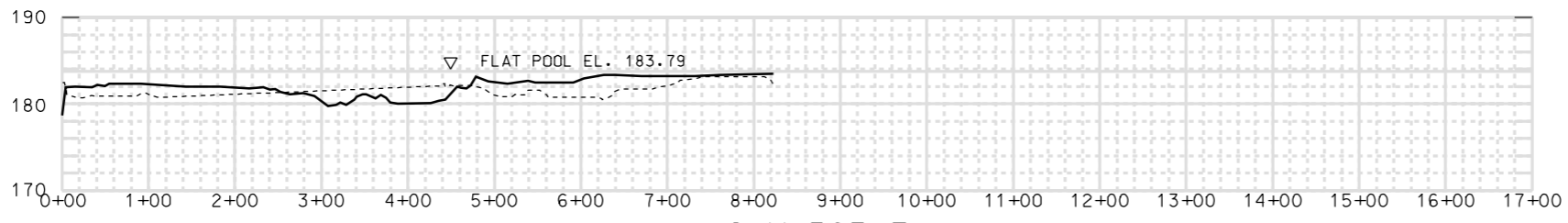
**PLATE 18**  
**PLATE 43**



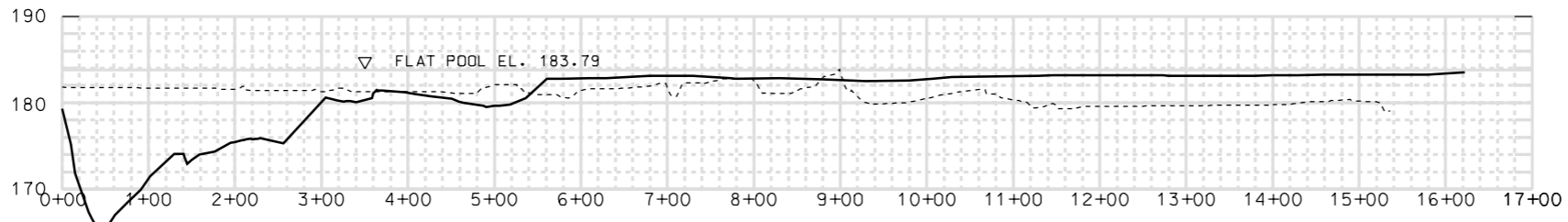
S-M 584.3



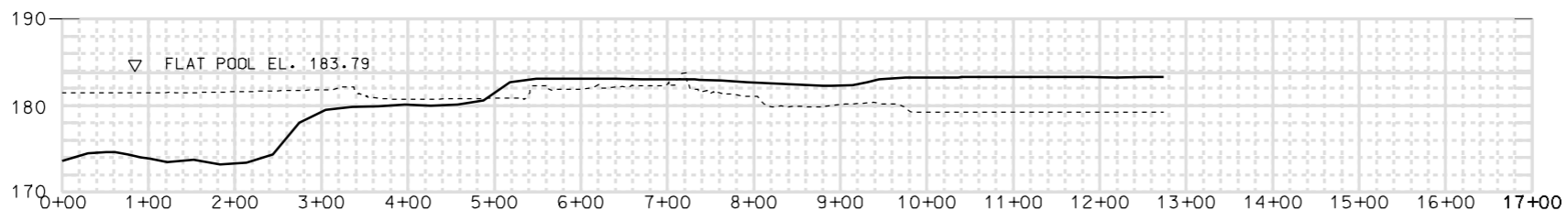
S-M 584.1



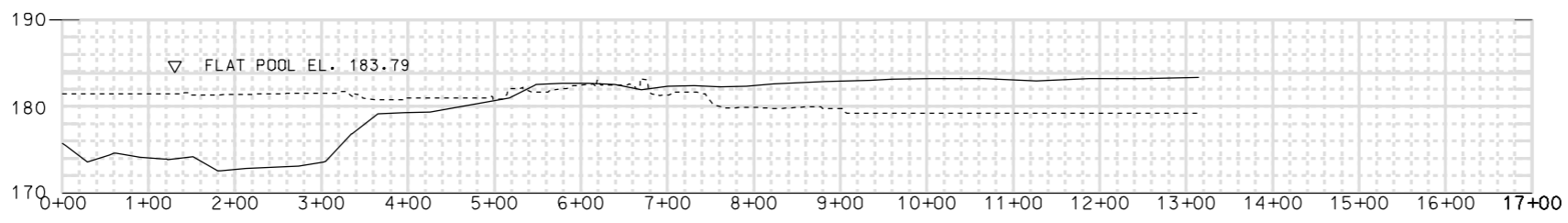
S-M 583.7



S-M 583.5



S-M 583.4



S-M 583.3

LEGEND

- GENERATED FROM 1990's DATA
- - - - - GENERATED FROM 1938 DATA

IOWA

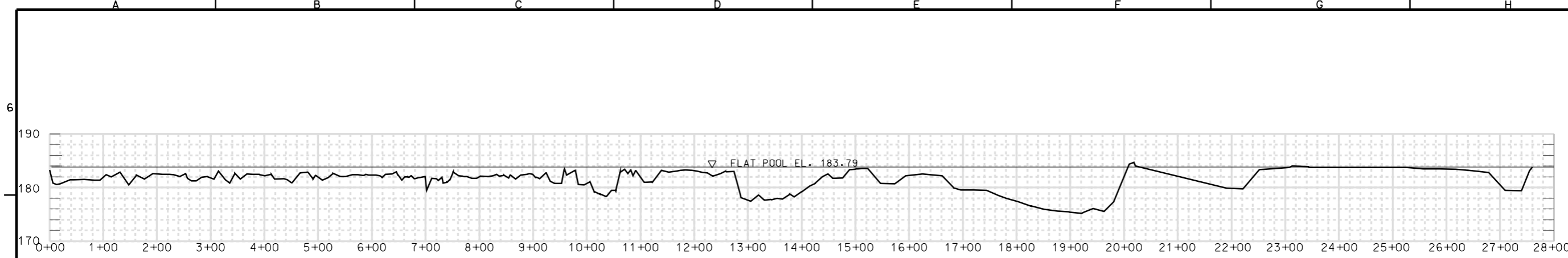
WISCONSIN

ALL DISTANCES, MEASUREMENTS AND  
ELEVATIONS SHOWN ARE IN METERS  
UNLESS NOTED OTHERWISE.

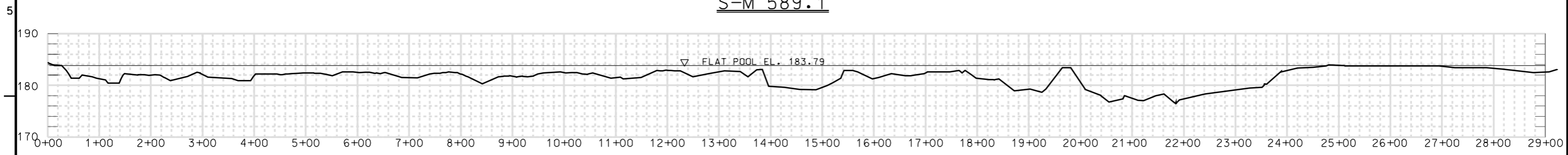
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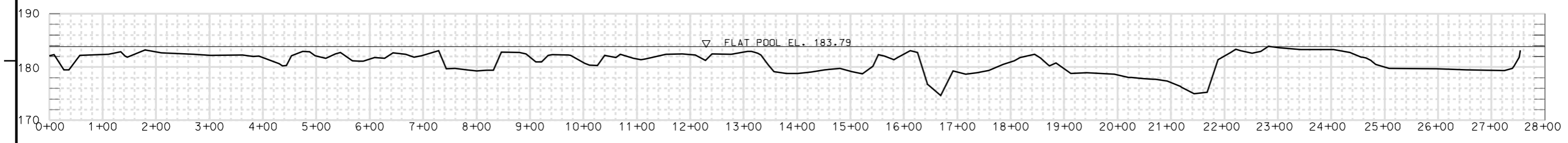
US Army Corps of Engineers  
Rock Island District



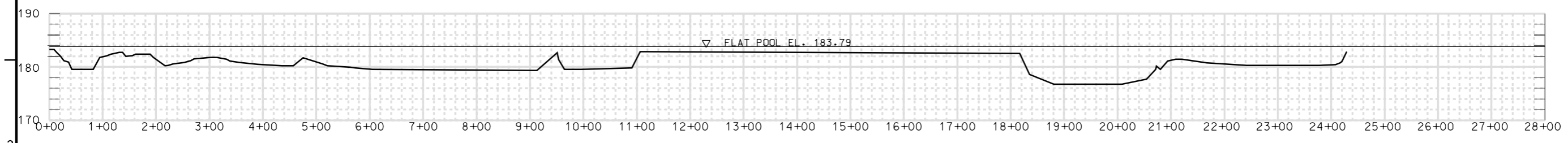
S-M 589.1



S-M 588.5



S-M 588.0



S-M 587.5

WISCONSIN

IOWA

LEGEND

— GENERATED FROM 1990's DATA

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

Symbol	Description	Date	Approved

Designated By: RTN	Date: 16 SEP. 2001
Drawn By: SOB/TPD	Scale: AS SHOWN
Checked By: KGB	Drawing Code:
Reviewed By: DJH	Soil Transection Number:

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT  
PROGRAM POOL 11  
RIVER MILES 583-594

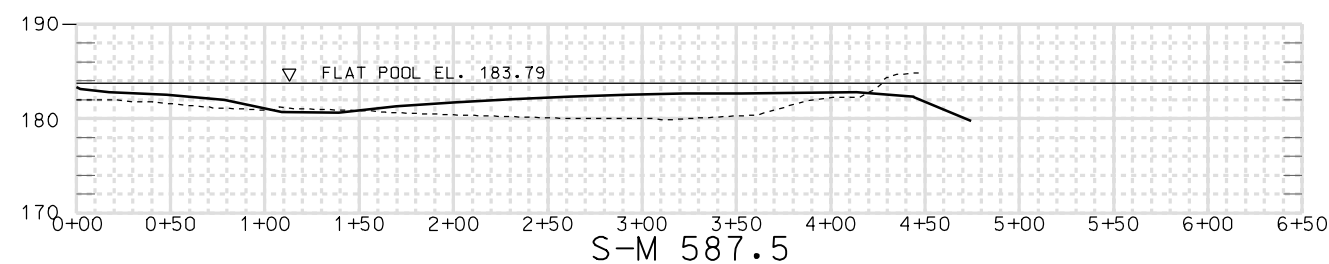
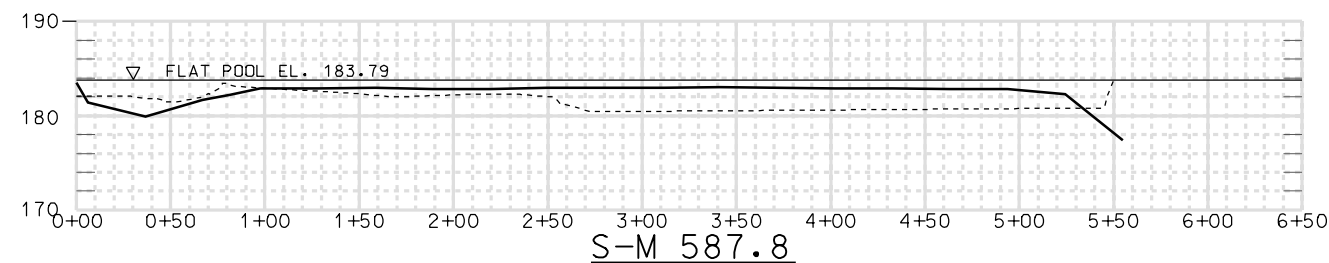
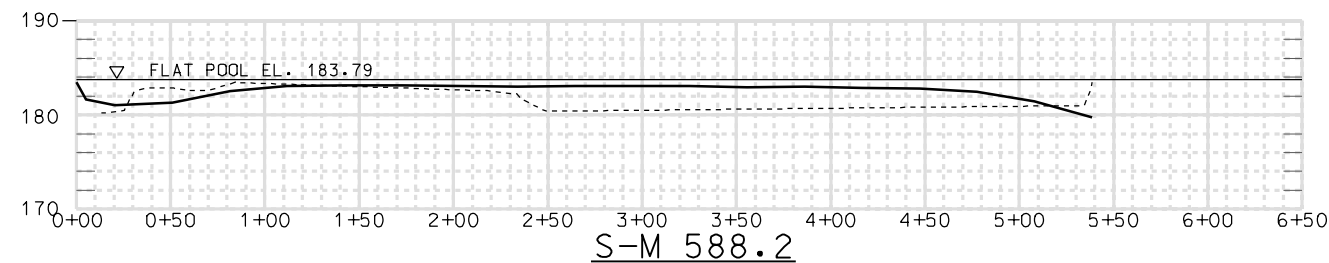
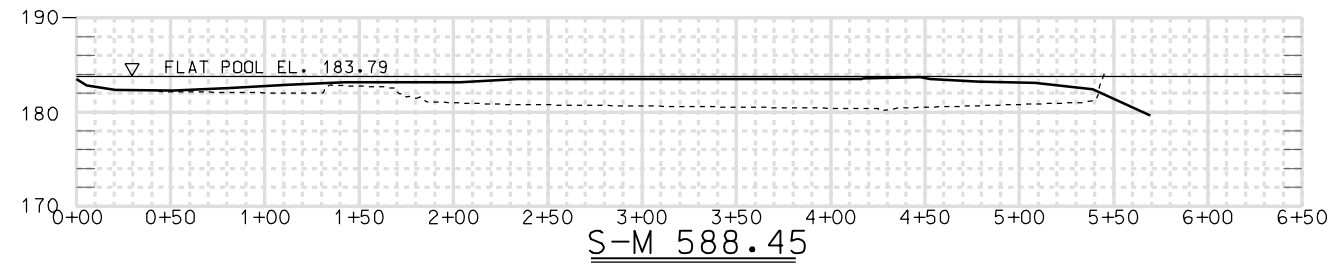
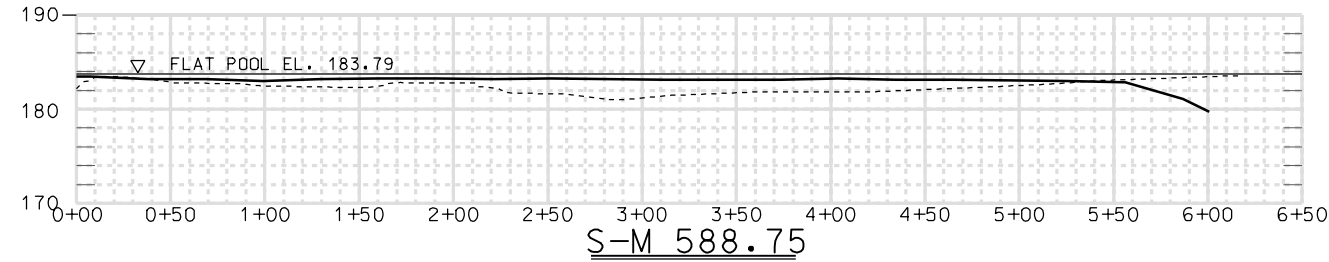
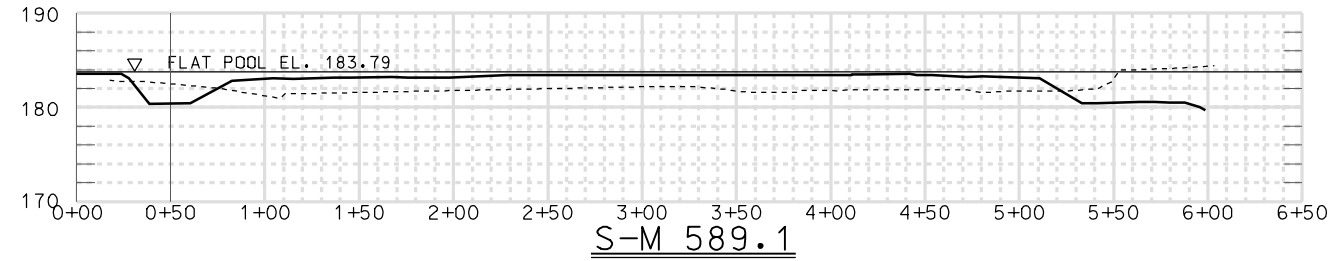
**MUD LAKE TRANSECTS**

**PLATE 19**  
**PLATE 44**

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US Army Corps  
of Engineers  
Rock Island  
District



LEGEND

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- GENERATED FROM 1938 DATA

IOWA

WISCONSIN

Symbol	Description	Date	Approved

U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: RTN	Date: 16 SEP. 2001
	Drawn By: TPD/SDB	Scale: AS SHOWN
	Checked By: KNM	Drawing Code:
	Reviewed By: DJH	Set/Revision Number:

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT  
PROGRAM POOL 11  
RIVER MILES 583-594  
**MUD LAKE TRANSECTS**

**PLATE 20**  
**PLATE 45**

ALL DISTANCES, MEASUREMENTS AND ELEVATIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

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**OPERATION AND MAINTENANCE MANUAL  
POOL 11 ISLANDS  
SUNFISH LAKE AND MUD LAKE  
HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

**MISSISSIPPI RIVER MILES 583.3 TO 593.0  
DUBUQUE COUNTY, IOWA AND GRANT COUNTY, WISCONSIN**

**AUGUST 2012**

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**MEMORANDA OF AGREEMENT AND EXISTING RIGHT-OF-WAY**

**APPENDIX B**

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## EXHIBIT A

**MEMORANDUM OF AGREEMENT  
BETWEEN  
THE DEPARTMENT OF THE ARMY  
AND  
THE UNITED STATES FISH AND WILDLIFE SERVICE  
FOR  
ENHANCING FISH AND WILDLIFE RESOURCES  
OF THE  
UPPER MISSISSIPPI RIVER SYSTEM  
AT POOL 11 ISLANDS HABITAT REHABILITATION AND ENHANCEMENT  
PROJECT, IOWA AND WISCONSIN**

### **I. PURPOSE**

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (USFWS) and the Department of the Army (DA) will operate in constructing, operating, maintaining, and rehabilitating the Pool 11 Islands, Iowa and Wisconsin, Habitat Rehabilitation and Enhancement Project, separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

### **II. BACKGROUND**

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. The project area is managed by the USFWS and is on lands managed as a national wildlife refuge. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, 100 percent of the construction costs of those fish and wildlife features at Pool 11 Islands, Wisconsin Habitat Rehabilitation and Enhancement Project, are the responsibility of (DA), and pursuant to Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580, 100 percent of operation and maintenance for Pool 11 Islands, Iowa and Wisconsin Habitat Rehabilitation and Enhancement Project, project areas are the responsibility of USFWS.

### III. GENERAL SCOPE

The project to be accomplished pursuant to this MOA shall consist of the following:

1. Construction of a deflection embankment and containment cells for hydraulically dredged material and the installation of a notched rock weir to maintain a constant inflow of oxygenated water at Sunfish Lake.

2. Construction of a deflection embankment, dredging of channels in Zollicoffer Slough and Mud Lake, and the installation of two (2) concrete rock weirs to maintain a constant inflow of oxygenated water at Mud Lake.

### IV. RESPONSIBILITIES

#### A. The DA is responsible for:

1. **Construction:** creating deep water habitat at Sunfish and Mud Lakes, by dredging, installing weir structures, and constructing deflection embankments and containment cells.

2. **Major Rehabilitation:** The Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

3. **Construction Management:** Subject to and using funds appropriated by the Congress of the United States, and in accordance with Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, the DA will construct the Pool 11 Islands, Wisconsin Habitat Rehabilitation and Enhancement Project, as described in the Definite Project Report with Integrated Environmental Assessment, Pool 11 Islands, Iowa and Wisconsin Habitat Rehabilitation and Enhancement Project, dated September 2001, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The USFWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of the Notice to Proceed. If the DA encounters potential delays related to construction of the project the DA will promptly notify the USFWS of such delays.

4. **Maintenance of Records:** The DA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the project to the extent and in such detail as will properly reflect total costs. The DA shall maintain such books, records, documents, and other evidence for a minimum of 3 years after completion of construction of the project and resolution of all relevant claims arising therefrom, and shall make available at its office, at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the USFWS.

**B: The USFWS is responsible for Operation, Maintenance, and Repair:** Upon completion of construction as determined by the District Engineer, Rock Island, the USFWS shall accept the project and shall operate, maintain, and repair the project as defined in the Definite Project Report with Integrated Environmental Assessment, Pool 11 Islands, Iowa and Wisconsin Habitat Rehabilitation and Enhancement Project, dated September 2001, in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580.

## **V. MODIFICATION AND TERMINATION**

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing. Unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the project.

## **VI. REPRESENTATIVES**

The following individuals or their designated representatives shall have authority to act under this MOA for their respective parties:

**USFWS:** Regional Director  
U.S. Fish and Wildlife Service  
Federal Building, Fort Snelling  
Twin Cities, Minnesota 55111

**DA:** District Engineer  
U.S. Army Engineer District, Rock Island  
Clock Tower Building  
P.O. Box 2004  
Rock Island, Illinois 61204-2004

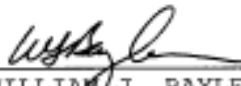



**EFFECTIVE DATE OF MOA**

This MOA shall become effective when signed by the appropriate representatives of both parties.

**THE DEPARTMENT OF ARMY**

**THE U.S. FISH AND WILDLIFE SERVICE**

BY:   
WILLIAM J. BAYLES  
Colonel, U.S. Army  
District Engineer

BY:   
WILLIAM F. HARTWIG  
Regional Director  
U.S. Fish and Wildlife  
Service

DATE: 5-30-02

DATE: 5-28-02

**OPERATION AND MAINTENANCE MANUAL  
POOL 11 ISLANDS  
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HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

**MISSISSIPPI RIVER MILES 583.3 TO 593.0  
DUBUQUE COUNTY, IOWA AND GRANT COUNTY, WISCONSIN**

**AUGUST 2012**

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**PROJECT REFERENCES AND REGULATIONS**

## APPENDIX C

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5. Section 107, Water Resources Development Act of 1992	C-4
6. ER 1110-2-101 – Reporting Evidence of Distress of Civil Works Structures	C-5

## 1. REGULATIONS

**1.1. Engineering Regulation (ER) 500-1-1, Natural Disaster Procedures.** US Army Corps of Engineers, CECW-OE, 30 September 2001. This regulation prescribes policies for the Civil Emergency Management Program of the US Army Corps of Engineers under the authorities of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (The Stafford Act; 42 U.S.C. 5121 et seq.); Army Regulation 500-60, Disaster Relief; and Engineer Regulation 1130-2-530, Flood Control Operation and Maintenance Policies. ER 500-1-1 can be found online at the following address:

<http://140.194.76.129/publications/eng-regs/er500-1-1/toc.htm>

**1.2. Engineering Pamphlet (EP) 500-1-1, Civil Emergency Management Program Procedure.** US Army Corps of Engineers, CECW-OE, 30 September 2001. This pamphlet prescribes processes and procedures for the management and execution of the Civil Emergency Management Program of the US Army Corps of Engineers under the authorities of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (The Stafford Act; 42 U.S.C. 5121 et seq.); Army Regulation 500-60, Disaster Relief; Engineer Regulation 1130-2-530, Flood Control Operations and Maintenance Policies; and Engineering Regulation 500-1-1, Natural Disaster Procedures. This pamphlet is a companion document to, and must be used in conjunction with, ER 500-1-1. In case of a discrepancy between this pamphlet and ER 500-1-1, ER 500-1-1 governs. EP 500-1-1 can be found online at the following address:

<http://www.sas.usace.army.mil/em/EP500.pdf>

**1.3.33 USC 408 Section 408. March 3, 1899.** It shall not be lawful for any person or persons to take possession of or make use of for any purpose, or build upon, alter, deface, destroy, move, injure, obstruct by fastening vessels thereto or otherwise, or in any manner whatever impair the usefulness of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States, or any piece of plant, floating or otherwise, used in the construction of such work under the control of the United States, in whole or in part, for the preservation and improvement of any of its navigable waters or to prevent floods, or as boundary marks, tide gauges, surveying stations, buoys, or other established marks, nor remove for ballast or other purposes any stone or other material composing such works: Provided, That the Secretary of the Army may, on the recommendation of the Chief of Engineers, grant permission for the temporary occupation or use of any of the aforementioned public works when in his judgment such occupation or use will not be injurious to the public interest: Provided further, That the Secretary may, on the recommendation of the Chief of Engineers, grant permission for the alteration or permanent occupation or use of any of the aforementioned public works when in the judgment of the Secretary such occupation or use will not be injurious to the public interest and will not impair the usefulness of such work.

**2. Definite Project Report.** *Upper Mississippi River System Environmental Management Program, Definite Project Report with Integrated Environmental Assessment (R-13F), Pool 11 Islands Habitat Rehabilitation and Enhancement*, U.S. Army Corps of Engineers, Rock Island District. September 2001.

**3. Manufacturer's Shop Drawings/Instructions.** These drawings and documents provide specific details of Federally installed equipment and provide manufacturer recommended operation and maintenance instructions. The USACE provided these documents to the USFWS at an earlier date.

**4. Flood Fighting and Emergency Measures.** Developed by the Rock Island District, this guidance describes techniques and procedures necessary to operate an environmental management project when threatened by a flood event. See Appendix E.

5. Section 107, Water Resources Development Act of 1992.

**SEC. 107. UPPER MISSISSIPPI RIVER PLAN.**

**(a) EXTENSION OF AUTHORIZATION.**—Section 1103(e) of the Water Resources Development Act of 1992 (33 U.S.C. 652(e)) is amended—

(1) in paragraph (2) by striking “ten” each place it appears and inserting “75”;

(2) by redesignating paragraphs (6) and (7) as paragraphs (7) and (8), respectively; and

(3) by inserting after paragraph (5) the following new paragraph:

“(6) TRANSFER OF AMOUNTS.—

“(A) GENERAL RULE.—Subject to subparagraph (B), for each fiscal year beginning after September 30, 1992, the Secretary, in consultation with the Secretary of the Interior, and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, may transfer not to exceed 20 percent of the amount appropriated to carry out each of subparagraphs (A), (B), and (C) of paragraph (1) to carry out any other of such subparagraphs.

“(B) LIMITATION.—The aggregate amounts obligated in fiscal years 1988 through 2002—

“(i) to carry out paragraph (1)(A) may not exceed \$183,600,000;

“(ii) to carry out paragraph (1)(B) may not exceed \$78,800,000; and

“(iii) to carry out paragraph (1)(C) may not exceed \$12,040,000.”.

**(b) FISH AND WILDLIFE HABITAT REHABILITATION AND ENHANCEMENT PROJECTS.**—Section 1103(e) of such Act is amended by striking paragraph (7)(A), as redesignated by subsection (a)(2), and inserting the following new paragraph:

“(7)(A) Notwithstanding the provisions of subsection (a)(2) of this section, the costs of each project carried out pursuant to paragraph (1)(A) of this subsection shall be allocated between the Secretary and the appropriate non-Federal sponsor in accordance with the provisions of section 906(e) of this Act; except that the costs of operation and maintenance of projects located on Federal lands or lands owned or operated by a State or local government shall be borne by the Federal, State, or local agency that is responsible for management activities for fish and wildlife on such lands.”.

6. ER1110-2-101 – Reporting Evidence of Distress of Civil Works Structures.  
<http://140.194.76.129/publications/eng-regs/er1110-2-101/entire.pdf>

CECW-E

Regulation  
No. 1110-2-101

DEPARTMENT OF THE ARMY  
US Army Corps of Engineers  
Washington, DC 20314-1000

ER 1110-2-101

15 March 1996

**Engineering and Design  
REPORTING OF EVIDENCE OF DISTRESS  
OF CIVIL WORKS STRUCTURES**

**1. Purpose**

This regulation prescribes the responsibilities and procedures for the immediate notification to higher authority of evidence of distress or potential failure of civil works projects. These procedures apply to projects under construction or in operation.

**2. Applicability**

This regulation applies to all HQUSACE/OCE element, major subordinate commands (MSC), districts, and field operating activities (FOA) having civil works responsibilities.

**3. References**

- a. ER 1110-2-100, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures.
- b. ER 1110-2-1802, Reporting Earthquake Effects.
- c. ER 1130-2-320, Equipment Failure and Generation Interruptions, Multiple-Purpose Projects with Power.

**4. Discussion**

The intent of this regulation is to keep the USACE chain of command informed by ensuring the immediate reporting, inspection, and followup evaluation of conditions that demonstrate evidence of distress or conditions that could result in a potential hazard at civil works projects. Initial reporting should be via telephone with a followup written summary with appropriate photographs.

**5. Procedures**

Evidence of distress at Corps projects, including

those listed in paragraph 6, will be immediately reported to the District Office. The district Dam Safety Officer will confirm the situation and determine if an engineering evaluation of the condition is required and if remedial measures will be required, and will immediately report the conditions, through command channels, to the HQUSACE Dam Safety Officer. If the HQUSACE Dam Safety Officer cannot be contacted, the reporting MSC or field office will follow the notification sequence as outlined in Appendix A. Each USACE Command will also establish procedures for notification of the Division and District Dam Safety Officers and coordination of all information with their counterparts in the Emergency Management element. The HQUSACE Dam Safety Officer will notify the Director of Civil Works and the Commander, USACE.

**6. Distress Signals**

Typical evidence of distress to be reported is as follows:

- a. Sloughs, settlement, or slides in embankments such as earth or rockfill dams, urban levees, and bridge abutments or slopes of spillway, channels, and lock and dam abutments.
- b. Evidence of piping, muddy water boils in the areas of a structure such as embankments, abutments, dam monoliths, lock walls, or cofferdams.
- c. Abnormal increase or decrease of flow from foundation drains, structural joints, or face drains of concrete dams.
- d. Any increase in seepage quantities through or under embankments or in abutments.
- e. Any significant change in pore-water

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This regulation supersedes ER 1110-2-101, dated 31 January 1993.

ER 1110-2-101  
15 Mar 96

pressure in either embankments or their foundations or abutments.

f. Any significant change in uplift pressures under concrete structures.

g. Unusual vertical or horizontal movement or cracking of embankments or abutments.

h. Significant cracking of mass concrete structures, either during construction or after completion.

i. Sinkholes or localized subsidence in the foundation of or adjacent to embankments or other pertinent structures critical to the safe operation of the project.

j. Excessive deflection, displacement, or vibration of concrete structures (e.g., tilting or sliding of intake towers, bridge piers, lock walls, or floodwalls).

k. Erratic movement, binding, excessive deflection, or vibration of outlet and spillway gates and large flow control valves.

l. Significant damage to any structure (e.g., barge damage to bridge piers or lock walls or ice flow damage to intake towers and access bridge piers).

m. Significant damage to, or changes in, structures, foundations, reservoir levels, groundwater conditions, and adjacent terrain as a result of seismic events. Special inspections for damages should be made immediately following the events as described in ER 1110-2-1802.

n. Any other indications of distress or potential failure that could inhibit the operation of a project

or endanger life and property.

o. Excessive vibration, binding, unusual noises, movements, or deflections of gate hoist operating equipment.

p. Actual hydraulic equipment operating pressure in excess of 125 percent of the normal operating pressure. Electric motor operating equipment overheating or stalling.

q. Erratic movement or unusual sounds such as bumping, jumping, or popping of lock miter gates.

r. Wire rope lifting cables or lifting chains having broken strands or deformed, worn, or severely corroded links.

s. Frequent power interruptions.

t. Excess movement of penstock flexible couplings.

u. Penstocks or turbine spiral cases that show signs of distress such as deformation or cracking.

v. Failure of major mechanical or electrical equipment at local flood protection projects.

## 7. Inspections

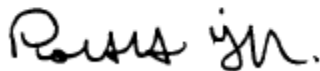
Special inspections to evaluate damages or changes should be made immediately following any of the events outlined in paragraph 6. This is particularly important in the case of earthquake damage.

## 8. Reporting Requirements

The requirements for reporting evidence of distress or potential failure as set forth above does not alter the requirements of regulations referenced in paragraph 3.

FOR THE COMMANDER:

1 Appendix  
APP A - HQUSACE Notification Plan



ROBERT H. GRIFFIN  
Colonel, Corps of Engineers  
Chief of Staff

**OPERATION AND MAINTENANCE MANUAL  
POOL 11 ISLANDS  
SUNFISH LAKE AND MUD LAKE  
HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

**MISSISSIPPI RIVER MILES 583.3 TO 593.0  
DUBUQUE COUNTY, IOWA AND GRANT COUNTY, WISCONSIN**

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**REFUGE MANAGER'S PROJECT INSPECTION AND MONITORING RESULTS**





**a. Off-Channel Dredging**

- ( ) Approximate depth of channel \_\_\_\_\_
- ( ) Significant sedimentation \_\_\_\_\_
- ( ) Undesirable debris \_\_\_\_\_
- ( ) Waste materials \_\_\_\_\_
- ( ) Unauthorized structures \_\_\_\_\_
- ( ) Other \_\_\_\_\_

**b. Embankments**

- ( ) Rock condition/replacement \_\_\_\_\_
- ( ) Undesirable debris \_\_\_\_\_
- ( ) Waste materials \_\_\_\_\_
- ( ) Unauthorized structures \_\_\_\_\_
- ( ) Erosion \_\_\_\_\_
- ( ) Suitable Vegetative Cover \_\_\_\_\_
- ( ) Other \_\_\_\_\_

**2. COMMENTS**

\_\_\_\_\_  
Refuge Manager

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**PHOTOS**

**APPENDIX E**

**Sunfish Lake**



**Photo 1. Sunfish Lake looking SW**



**Photo 2. Constructed Embankments**



**Photo 3. Confined Disposal Facility Cell 1**



**Photo 4. Confined Disposal Facility Cell 2**



**Photo 5. Flow Inlet Structure**



**Photo 6. Riprap Dike**



**Photo 7. Embankment**



**Photo 8. Migrating Birds on Site**



**Photo 9. Embankment**



**Photo 10. Downstream of Site Looking North**





**Photo 11. Island and Confined Disposal Facility Construction**



**Photo 13. North End of Site Looking NE**



**Photo 12. Construction of Riprap Dike**



**Photo 14. South End of Site Looking NE**



**Photo 15. Embankment B**



**Photo 16. Erosion Protection on Embankment B**



**Photo 19. Erosion Protection Embankment B**



**Photo 17. Aquatic Vegetation**



**Photo 20. Embankment Construction**



**Photo 18. Flow Inlet Structure**



**Photo 21. Embankment Construction**





**Photo 22. Rock Spur Dike**



**Photo 23. Embankment Construction**



**Photo 24. Aquatic Vegetation**



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**MANUAL DISTRIBUTION**

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US Army Corps of Engineers, Rock Island District  
Clock Tower Building  
PO Box 2004  
Rock Island, Illinois 61204-0004  
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